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AN ASSESSMENT OF THE IMPLICATIONS OF RANK INVERSION ON OCCUPATIONAL SUSTAINABILITY

By

Dr. A. Jesion
and
L.F. Kerzner

OTTAWA, CANADA

July 1999

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Recommended by: _____
for Team Leader,
Personnel Operational
Research Team

Approved by: _____
Director,
Operational Research
(Corporate, Air, Maritime)

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OTTAWA, CANADA

July 1999

ABSTRACT

This paper documents the Human Resource (HR) modelling support provided by the Personnel Operational Research Team (PORT) in support of the Military Occupational Structure (MOS) Review with respect to an impact assessment of whether or not rank inversion threatens the sustainability of affected occupations. Each instance of rank inversion has been examined using appropriate analytical models and available HR data. Affected Military Occupations (MOCs) have been classified in one of the following categories:

a. MOCs which have little or no systemic sustainability problems in the inversion ranks and which should not require any remedial action (GREEN);
b. MOCs which have short term or intermittent sustainability problems which may require remedial action (AMBER); or
c. MOCs which have severe sustainability problems and definitely require remedial action (RED).

RÉSUMÉ

Cet article explique le soutien en matière de modélisation des ressources humaines (RH) offert par l'Équipe de recherche opérationnelle du personnel (EROP) dans le cadre de la révision de la structure des groupes professionnels militaires (SGPM). Il traite en particulier de l'étude d'impact concernant l'inversion des grades, à savoir si celle-ci menace ou non la soutenabilité des groupes professionnels touchés. Chaque cas d'inversion de grades a été étudié à l'aide des modèles analytiques appropriés et des données sur les RH disponibles. Les groupes professionnels militaires (GPM) touchés ont été classés dans l'une des catégories suivantes:

a. les GPM qui n'ont pas ou peu de problèmes systématiques de soutenabilité avec l'inversion de grades et qui ne nécessitent aucune mesure corrective (VERT);

b. les GPM qui ont des problèmes de soutenabilité à court terme ou de façon intermittente et qui peuvent nécessiter des mesures correctives (AMBRÉ); ou

c. les GPM qui ont de graves problèmes de soutenabilité et qui nécessitent assurément des mesures correctives (ROUGE).

EXECUTIVE SUMMARY

1. In support of the Military Occupational Structure (MOS) Review, the Personnel Operational Research Team (PORT) was requested by the Director Military Human Resource Requirements (DMHRR) to develop HR models of military occupations which have "rank inversions".[1] Approximately twenty Non-Commissioned Member (NCM) occupations currently have rank inversion in one form or another.

2. The analysis reported here was conducted using occupational models developed within the Generic Model (GeM) building environment. GeM is a powerful software environment used primarily for developing HR simulations. Simulation results for each Military Occupation (MOC) under review were obtained using the best available information.

3. Using both quantitative observations and qualitative arguments, the MOCs affected by rank inversion have been classified as follows:

   a. MOCs which have little or no systemic sustainability problems in the inversion ranks and which should not require any remedial action (GREEN);

   b. MOCs which have short term or intermittent sustainability problems which may require remedial action (AMBER); or

   c. MOCs which have severe sustainability problems and definitely require remedial action (RED).

4. Table ES-I lists the proposed GREEN MOCs according to the analysis reported in this paper. No remedial action is warranted for these MOCs, although they should be monitored for problems on a regular basis.

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[1] "Rank inversion" occurs when the population size at a particular rank in an occupation exceeds the population in a lower or "feeder" rank.

Table ES-I

MOCs With Rank Inversions Which

Have No Sustainability Problem ("GREEN")

MOC	CODE	ABBREVIATION
Airborne Electronic Sensor Operator	081	AES OP
Artilleryman Air Defence	022	ARTYMN AD
Dental Clinic Assistant	722	DENT CL A
Field Engineer	041	FD ENGR
Field Engineer Equipment Operator	042	FEE OP
Naval Electronic Sensor Operator	276	NES OP
Resource Management Support Clerk	836	RMS CLK
Search and Rescue Technician	131	SAR TECH

5. Table ES-II lists the proposed AMBER MOCs according to the analysis reported in this paper. These MOCs may require further study to determine whether or not remedial action is required.

Table ES-II

MOCs With Rank Inversions Which

May Have Sustainability Problems ("AMBER")

MOC	CODE	ABBREVIATION
Clearance Diver Technician	342	CL DIV T
Construction Technician	648	CONST TECH
Electrical Distribution Technician	642	ED TECH
Marine Engineering (Artificer)	314	MAR ENG (A)
Preventive Medicine Technician	716	PMED TECH

6. Table ES-III lists the proposed RED MOCs according to the analysis reported in this paper. These MOCs are forecast to have serious problems with sustainability and definitely require remedial action. The list does not include Geomatics Technician (MOC 142) and Intelligence Operator (MOC 111) which are technically in this category. However, within these occupations the rank below the inversion rank is used as a "place holder" for personnel who are pre-selected for promotion into the higher rank and are undergoing transitional training. Thus these MOCs are actually GREEN in practice.

Table ES-III

MOCs With Rank Inversions Which

Have Serious Sustainability Problems ("RED")

MOC	CODE	ABBREVIATION
Electrical Technician	331	E TECH
Flight Engineer	091	FLT ENGR
Marine Engineering (Technician)	313	MAR ENG (T)
Meteorological Technician	121	MET TECH
Operating Room Technician	713	OR TECH

7. Although some suggestions for remedial action are made in the main body, a detailed examination of each situation is beyond the scope of this paper. Further work in modelling occupational sustainability is contingent upon sponsor interest and availability of resources in the PORT work program.

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MOC 111 – INT OP	32
MOC 314 – MAR ENG (A) and MOC 313 – MAR ENG (T)	36
MOC 121 – MET TECH	40
MOC 276 – NES OP	42
MOC 713 – OR TECH	44
MOC 716 – PMED TECH	46
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AN ASSESSMENT OF THE IMPLICATIONS OF RANK INVERSION ON OCCUPATIONAL SUSTAINABILITY

I. INTRODUCTION

Background

1. In support of the Military Occupational Structure (MOS) Review, the Personnel Operational Research Team (PORT) was requested by the Director Military Human Resource Requirements (DMHRR) to develop HR models of military occupations which have "rank inversions".[1] Twenty Non-Commissioned Member (NCM) occupations currently have rank inversion in some form. In most cases, the authorized Preferred Manning Level (PML) for such occupations has a greater number of sergeants (SGTs) than master corporals (MCPLs). DMHRR required a preliminary assessment of the career flow consequences for these problem occupations before attempting to implement any remedial policies.

2. In particular, DMHRR raised the following questions:

   a. what are some impacts of rank inversion on the promotion flow;
   b. to what degree do rank inversions pose a problem;
   c. are the affected occupations sustainable over the long range; and
   d. to which occupations should remedial action be addressed in priority?

Aim

3. The aim of this paper is to document the human resource (HR) modelling support provided by PORT to DMHRR in support of the MOS Review with respect to an impact assessment of whether or not rank inversion threatens the sustainability of affected occupations.

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[1] "Rank inversion" occurs when the population size at a particular rank in an occupation exceeds the population in a lower or "feeder" rank.

Limitations

4. PORT, using attrition information contained in its strategic desktop computer database [2], developed and/or modified approximately 20 NCM models in order to complete the requested analysis and to report the results contained in this paper. The models and input data have been tested for reliability. However, as a result of limited resources available for carrying out this study (including time constraints imposed by the sponsor of this research), a full sensitivity analysis on the results could not be done. However, the authors believe that the trends observed through running these models are reliable indicators of the sustainability of the affected occupations in this study. Although care was taken to obtain accurate data and to check modelling assumptions, the results reported here should be regarded as preliminary, particularly if establishment levels are altered in the future or if short-term remedial measures are to be applied.

II. THE GENERIC MODEL (GeM)

A Model Building Utility

5. The analysis reported here was conducted using occupational models developed within the Generic Model (GeM) building environment. GeM is a powerful software environment used primarily for developing HR simulations. It was originally developed by the Directorate of Manpower Analysis (D Man A) as a family of executable programs that operated in the OS/2 environment. GeM now operates in the Windows 95 environment with the use of a Graphical User Interface (GUI). The most recent version of GeM (i.e. GeM 6) incorporates a visual model building environment as well as model execution animations. Another new feature of GeM 6 is the multiple run facility which was used extensively to complete this analysis.

6. Models developed in the GeM environment capture the influences of the many intricacies of the Canadian Forces' (CF) system of career development such as:

a. controlled ranks;
b. minimum time in rank (TIR) requirements before promotion;
c. contract renewal through the CF Career Development Plan (CFCDP) system of gates;
d. minimum/maximum promotion/intake bounds;
e. compulsory retirement age (CRA); and
f. a variety of entry plans having individualized entry demographics.

7. Career flow modelling of CF military occupations (MOCs), as conducted in GeM, has achieved a great deal of acceptance among personnel planners and career managers. It is a routine part of the analysis supporting occupational restructuring, a tool for investigating the policy alternatives for Annual Military Occupational Reviews (AMORs), and has provided short term guidance in the setting of intake and CFCDP gate levels to meet occupational objectives.

III. METHODOLOGY

GeM Model Assumptions

8. Major GeM model input assumptions are as follows:

a. the PML for each rank in each model year;
b. maximum/minimum intake limits for each model year;
c. minimum time in rank (TIR) criteria for promotion at each rank;
d. voluntary attrition rates;
e. promotion probabilities as a function of years of service (YOS) for NCM occupations; and
f. CFCDP gates/conversion probabilities.

9. Since inclusion of all input assumptions for each of the GeM models used in this study would greatly expand the length of this report, interested readers are invited to contact the authors for detailed model data.

10. Table I (on the next page) contains a list of 20 NCM MOCs which have rank inversions. MOC codes are included as these are often used as surrogates for MOC abbreviations.

Measures of MOC PML Sustainability

11. Most GeM modelling results are provided to clients in the form of tables and/or charts. Upwards of 80 charts are available in each instance and such a volume of information greatly exceeds what might be required by the client. In this study, while all results have been examined for their information content, only the two most significant charts per MOC are shown to demonstrate "trends" with respect to MOC sustainability.

12. For each MOC in this study, a chart is given containing modelling forecasts of promotion flow into the "inversion" rank, i.e. the higher rank with the greater population. This is usually the SGT rank, except for ARTYMN AD and MAR ENG (A) where the inversion rank is Warrant Officer (WO)/Petty Officer First Class (PO1), and PMED TECH and GEO TECH where it is at MCPL. In particular, the chart contains forecasts of the number of personnel at the "feeder" rank eligible for promotion together with the number actually promoted, for each model year - over a 25 year time interval. (Personnel are considered eligible for promotion after a minimum TIR, usually two years at the MCPL rank and three years at the SGT rank.) Desirable characteristics in these promotion charts are stability and "fair" promotion prospects for each cohort in the "eligible" population. If promotion probabilities are very high, then concerns may arise about "quality control" and operational effectiveness. Clearly, when promotion probabilities approach 100%, then there is a further risk that no suitably qualified personnel will be available to fill vacancies in the inversion rank.

Table I

List Of NCM MOCs With Rank Inversions [2]

MOC	CODE	ABBREVIATION
Airborne Electronic Sensor Operator	081	AES OP
Artilleryman Air Defence	022	ARTYMN AD
Clearance Diver Technician	342	CL DIV T
Construction Technician	648	CONST TECH
Dental Clinic Assistant	722	DENT CL A
Electrical Technician	331	E TECH
Electrical Distribution Technician	642	ED TECH
Field Engineer	041	FD ENGR
Field Engineer Equipment Operator	042	FEE OP
Flight Engineer	091	FLT ENGR
Geomatics Technician	142	GEO TECH
Intelligence Operator	111	INT OP
Marine Engineering (Artificer)	314	MAR ENG (A)
Marine Engineering (Technician)	313	MAR ENG (T)
Meteorological Technician	121	MET TECH
Naval Electronic Sensor Operator	276	NES OP
Operating Room Technician	713	OR TECH
Preventive Medicine Technician	716	PMED TECH
Resource Management Support Clerk	836	RMS CLK
Search and Rescue Technician	131	SAR TECH

[2] MOCs 142, 313, and 314 were not on the original DMHRR list.

13. As complementary information, the second chart given for each MOC is a plot of the average TIR at promotion to the inversion rank. This measure shows the experience levels of personnel upon promotion, albeit in another way from the previous chart. If TIR distributions are close to the minimum acceptable for promotion, then, as noted in the previous paragraph, the MOC may run the risk of being unable to train personnel to fill vacancies. Furthermore, very low TIR for newly promoted personnel may affect operational effectiveness if this is the norm instead of the exception. The TIR chart may assist HR managers in gauging "morale" of the personnel in the MOC, because high variability in TIR at promotion is a "dissatisifer" to personnel. Only the inversion rank is given here, although information concerning all ranks is available from the authors.

14. These two charts alone cannot measure occupational sustainability. However, central to the questions posed by the sponsor is the availability of suitable personnel for promotion when required. This is why the choice has been made to have as a measure of MOC PML sustainability, the ratio of the numbers of promotions to the numbers eligible for promotion. If this ratio is high or highly variable, then the MOC may face systemic problems with maintaining the required PML.

Modelling Assumptions

15. For this study, previously developed GeM models for each MOC under review were updated to GeM 6 standard and more current input data were obtained. These input data were primarily related to updates of PML targets, starting population levels (as defined in the Projected Status Report, PSR), and the addition of recent attrition data. Assumptions concerning promotion zones and contract conversions were unchanged in the new models. It should be noted that the GeM model for each MOC (or family of MOCs) attempts to qualify as many NCMs as needed to meet PML targets subject to the capacity limits in the training system. It should be noted that recent intake levels for most of the

affected MOCs have been less than needed to reach PML targets. Should current intake levels be maintained, the conclusions drawn in this paper could be considered too optimistic.

16. As a result of recent efforts to update the PORT HR database, the baseline model year has moved to 1999 (i.e. Model Year 0 corresponds to April 1999 data). This marks a change from other recently competed PORT HR simulation studies. "Forecasts" now begin at Model Year 1 (i.e. year 2000).

17. The variability of HR simulation results for small populations is of concern. [3] Since some of the MOC population sizes in this study are small, it was decided to carry out 10 replications of each MOC simulation (using the new multiple run function of GeM 6). Results reported here are thus averages of 10 "independent" simulations, each using the same modelling assumptions and different random number seeds.

18. The assumed PML targets are given in Table II (on the next page). The inversion ranks are indicated by bold font and include several cases which were not on the original list provided by DMHRR to PORT.

Table II

Preferred Manning Level Assumptions

MOC	CWO	MWO	WO	SGT	MCPL	CPL PTE
AES OP	5	24	46	84	51	
ARTYMN AD	4	12	46	35	62	149
CL DIV T	4	11	14	22	17	17
CONST TECH				43	35	105
DENT CL A	1	4	10	30	30	88
E TECH	7	24	50	92	83	70
ED TECH				20	18	71
FD ENGR	12	26	67	147	112	528
FEE OP	2	10	19	49	36	129
FLT ENGR	8	21	51	132	80	41
GEO TECH	3	6	19	31	47	8
INT OP	3	11	59	94	55	34
MAR ENG (A)*	17	66	127	93		
MAR ENG (T)*				84	120	262
MET TECH	6	6	42	51	17	76
NES OP	5	19	39	62	57	167
OR TECH			1	14	4	14
PMED TECH			10	18	22	17
RMS CLK	26	93	305	732	642	1117
SAR TECH	3	6	12	60	47	

* MAR ENG (A) and MAR ENG (T) are linked at the SGT (i.e. PO2) rank.

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IV. MODELLING RESULTS

MOC 081 – AES OP

19. This MOC has a PML of 210 (all ranks) with an inversion at the SGT rank. The inversion ratio (SGT:MCPL) is approximately (1.6:1), hereafter denoted by the numerator only. The PSR [4] indicates that the MOC has been operating below its PML for the past two years. The MOC is estimated to be 15% below its PML by 1 Apr 2000, reducing the pool of MCPLs to below 50% of its PML. For the AES OP model, an intake of 10 MCPLs per year was assumed. This guaranteed that the simulation for this occupation met the PML target throughout the 25 year modelling horizon. Had this not been assumed, much higher promotion rates would have been observed in the near future.

20. Figure 1 presents modelling results for a 25 year time horizon for promotions to SGT in MOC 081. All results are averages over 10 simulation runs. The number of MCPLs "eligible for promotion" to SGT ranges from 38 to 49, averaging 42 over the 25 model years. The number of MCPLs promoted to SGT is forecast to vary between 4 and 15, with an average of approximately 11 per year. In terms of promotion rates, the range was 9% to 37% with an average promotion rate of 26%. These variations are of concern, but the SGT rank in this MOC faces no systemic shortages (in the simulation).

21. Figure 2 presents modelling results over a 25 year time horizon for average TIR at promotion to SGT in MOC 081 – based on 10 simulation runs. The TIR at promotion to SGT ranges from 3.0 to 4.8, averaging 3.8 over the 25 model years. The GeM model for this MOC assumes that a minimum of 2 years in rank is required before promotion to SGT is possible. If this is sufficient time to train personnel for potential promotion, there does not appear to be any difficulty in staffing the SGT rank with qualified MCPLs in spite of the population inversion. That is, manning levels are sustainable in this MOC (under the assumptions made in the model).

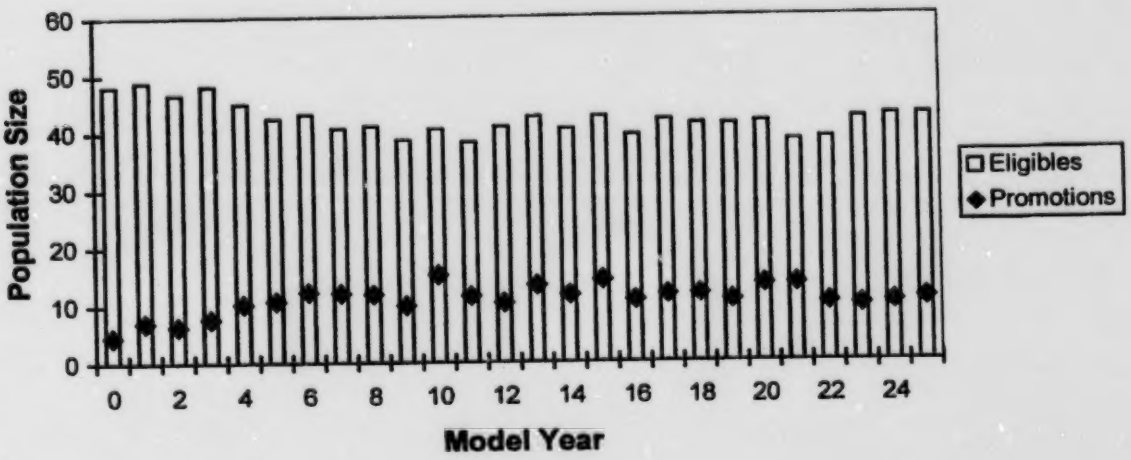

Figure 1: Forecast of Promotions to SGT
AES OP (MOC 081)

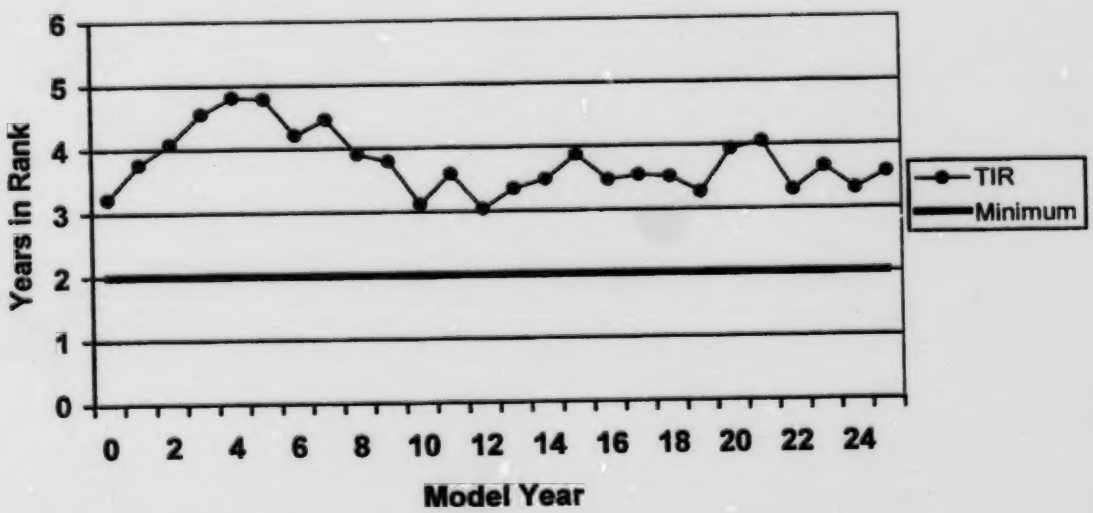

Figure 2: Forecast of Average Time In Rank at Promotion to SGT
AES OP (MOC 081)

MOC 022 – ARTYMN AD

22. This MOC has a PML of 308 (all ranks). There is a PML inversion at the WO rank. The inversion ratio (WO:SGT) is approximately 1.3. This occupation has undergone a reduction in its operating base while having to retain a relatively large cadre of senior NCMs to maintain air defence training. The PSR [4] indicates that the occupation has been operating below its PML for the past two years. This is expected to continue so that MOC has been estimated to be 25% below its PML by 1 Apr 2000. The occupation is just recovering from a period of limited promotion to WO.

23. Figure 3 presents modelling results over a 25 year time horizon for promotions to WO in MOC 022. All results are averages of 10 simulation runs. The number of SGTs "eligible for promotion" to WO ranges from 15 to 30, averaging 25 over the 25 model years. The number of SGTs promoted to WO is forecast to vary between 3 and 9, with an average of approximately 5 per year. In terms of promotion rates, the range was 9% to 39% with an average promotion rate of 22%. Modelling results indicate that as senior NCMs retire over the next decade, the annual promotion rate is expected to rise substantially. This will draw upon those eligible for promotion at a greater rate, in turn causing a reduction in the size of the pool of eligible candidates for promotion. Thus simulation results are indicative of a sustainable WO PML.

24. Figure 4 presents modelling results over a 25 year time horizon for average TIR at promotion to WO in MOC 022 – based on 10 simulation runs. The TIR at promotion to WO ranges from 3.1 to 6.5, averaging 4.5 over the 25 model years. The model for this MOC assumes that a minimum of 3 years in rank is required before promotion to WO is possible. If this is sufficient time to train personnel for potential promotion, there does not appear to be any difficulty in staffing the WO rank with qualified SGTs in spite of the population inversion. That is, manning levels are sustainable, under the assumptions made in the model.

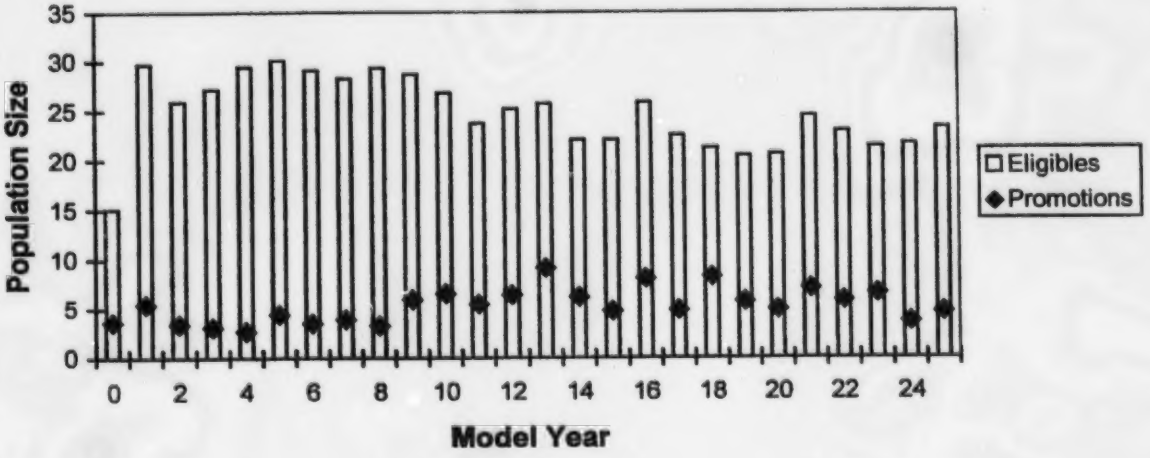

Figure 3: Forecast of Promotions to WO ARTYMN AD (MOC 022)

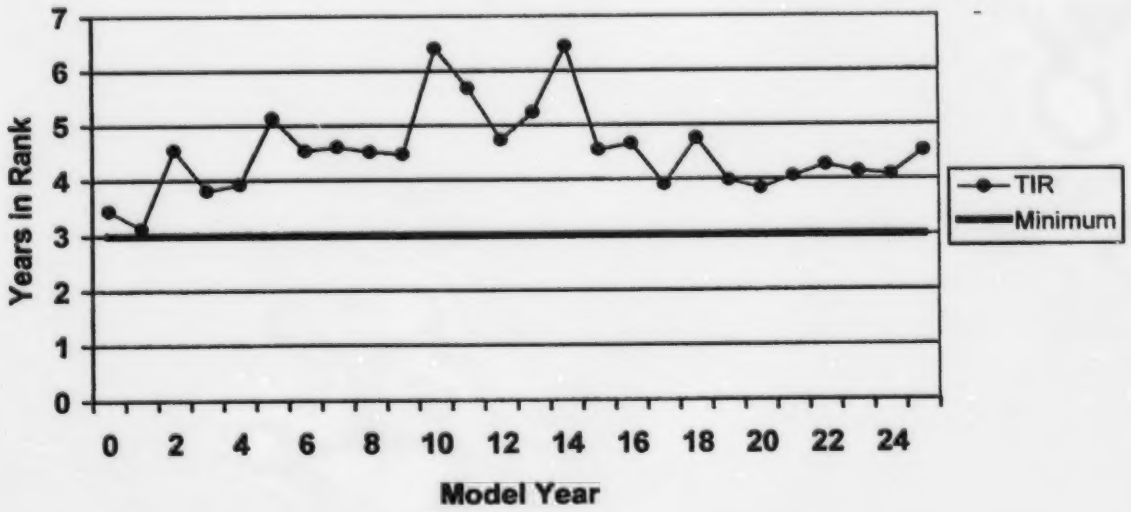

Figure 4: Forecast of Average Time in Rank at Promotion to WO ARTYMN AD (MOC 022)

MOC 342 – CL DIV T

25. This MOC has a small PML (85 all ranks). The inversion ratio (CPO2:MS) is approximately 1.3. To further complicate matters, the PML for LS/AB is equal to the PML for MS. The PSR [4] indicates that the occupation has been operating near its PML for the past two years. The occupation is expected to experience a doubling of attrition between 2002 and 2005. This accounts for the rather high promotion rates observed below. To maintain PML during this period, qualified intake averaged 6 per year. At this rate, a reserve of personnel at the MS rank could be created to sustain promotion rates.

26. Figure 5 presents modelling results over a 25 year time horizon for promotions to PO2 in MOC 342 – based on 10 simulation runs. The number of MS "eligible for promotion" to PO2 ranges from 3 to 14, averaging 10 over the 25 model years. The number of MS promoted to PO2 is forecast to vary between 2 and 9, with an average of approximately 4 per year. In terms of promotion rates, the range was 25% to 73% with an average promotion rate of 44%. For promotions to MS (not shown), the situation is similar with promotion rates varying between 31% and 78%, averaging 50% over 25 model years. If personnel are required for promotion with minimum time in rank at two ranks in succession, there would be a serious risk that trained personnel will not be available for promotion to the PO2 rank.

27. Figure 6 presents modelling results over a 25 year time horizon for average TIR at promotion to PO2 in MOC 342 – based on 10 simulation runs. The TIR at promotion to PO2 ranges from 2.0 to 3.7, averaging 2.8 over the 25 model years. The model for this MOC assumes that a minimum of 2 years in rank is required before promotion to PO2 is possible. For promotions to MS (not shown), the situation is similar with TIR at promotion varying between 2 and 3.7, averaging 2.7 over 25 model years. Having an average TIR at promotion close to the minimum is symptomatic of systemic problems in this MOC, under the assumptions made in the model.

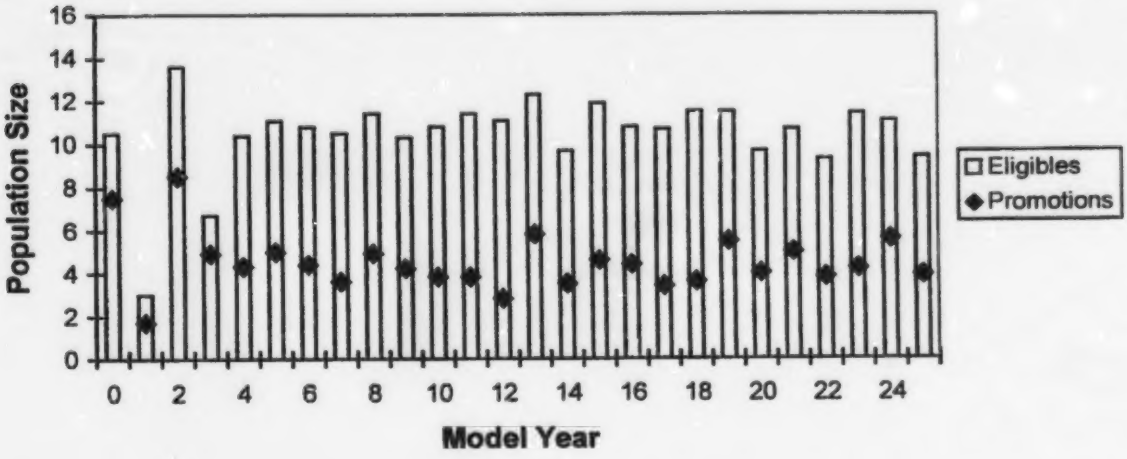

Figure 5: Forecast of Promotions to PO2
CL DIV T (MOC 342)

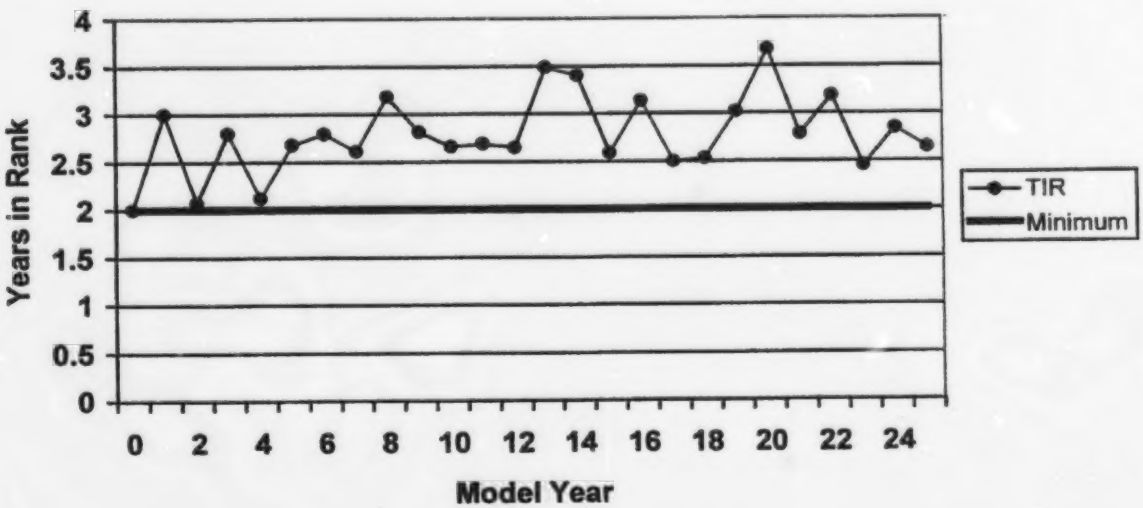

Figure 6: Forecast of Average Time in Rank at Promotion to PO2
CL DIV T (MOC 342)

MOC 648 – CONST TECH

28. This new MOC is relatively small with a PML of 183 (all ranks). The MOC rank progression ends at the SGT rank, with qualified personnel eligible for promotion to MOC 649 (Constriction Engineering Supervisor, CE SUPT). There is a rank inversion (SGT:MCPL) of approximately 1.2. The PSR indicates that this MOC is substantially short at the CPL rank [4]. To overcome this PML difference, the modelling assumed an intake next year of 27 CPLs and generated a requirement for an average of 25 per year for the following three years.

29. CONST TECH is one of six MOCs which "feed" into the CE SUPT MOC. As such, it is necessary to run a simulation for this entire complex in order to generate results. Figure 7 presents modelling results over a 25 year time horizon for promotions to SGT in MOC 648 – based on 10 simulation runs of the "600 Series" of MOCs. The number of MCPLs "eligible for promotion" to SGT ranges from 19 to 33, averaging 24 over the 25 model years. The number of MCPLs promoted to SGT is forecast to vary between 6 and 13, with an average of approximately 9 per year. In terms of promotion rates, the range was 26% to 51% with an average promotion rate of 35%. This occupation is the main feeder branch for CE SUPT. This latter occupation is expected to require a substantial intake of over 25 SGTs per year from its feeder occupations between 2001 and 2007. This is reflected in the high promotion rates to SGT shown. Once CE SUPT release rates moderate, a sufficiently large pool of eligible MCPLs will be available to sustain the MOC.

30. Figure 8 presents modelling results over a 25 year time horizon for average TIR at promotion to SGT in MOC 648 – based on 10 simulation runs. The TIR at promotion to SGT ranges from 2.6 to 4.4, averaging 3.2 over the 25 model years. The average TIR becomes relatively stable after the first few years of the transition and the PML at the SGT rank is sustainable.

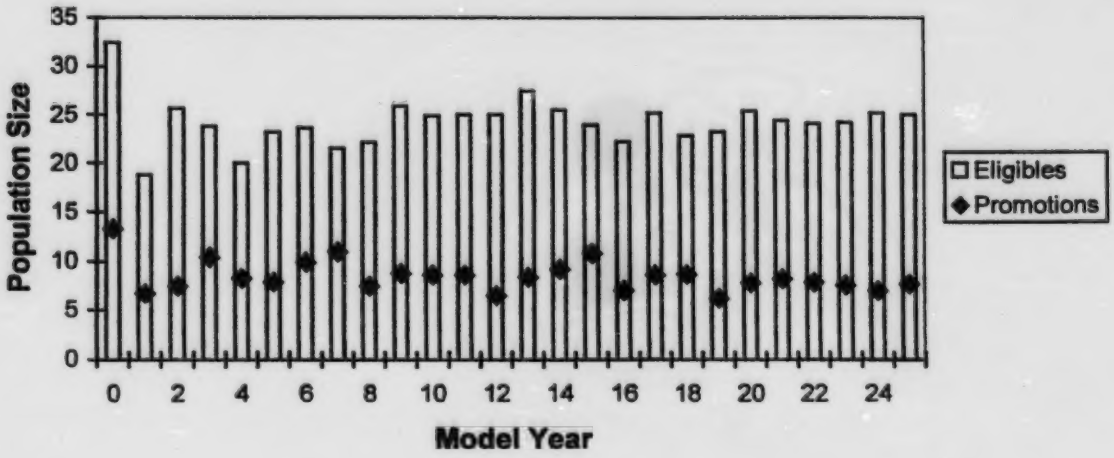

Figure 7: Forecast of Promotions to SGT CONST TECH (MOC 648)

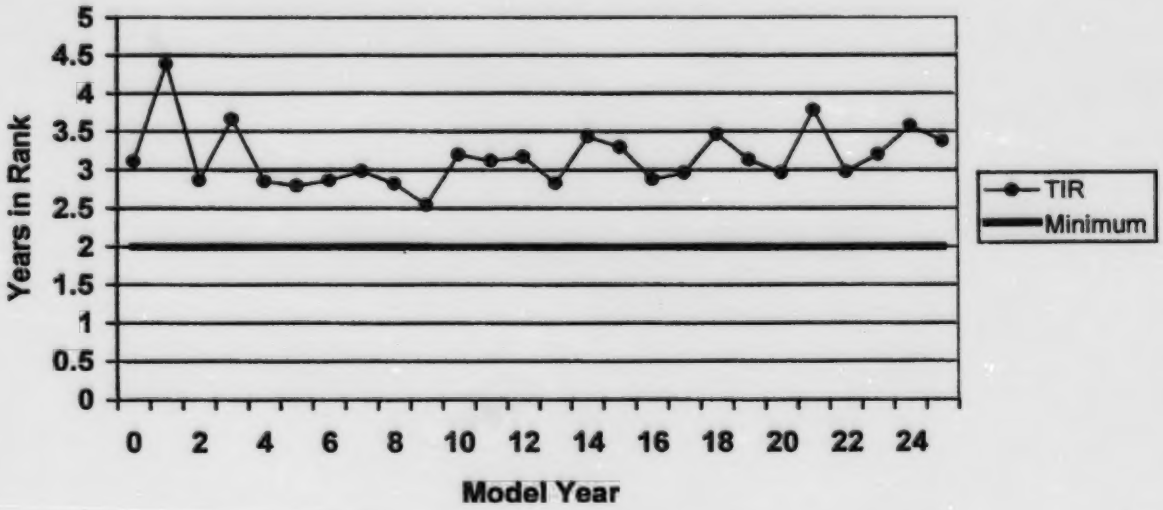

Figure 8: Forecast of Average Time in Rank at Promotion to SGT CONST TECH (MOC 648)

MOC 722 – DENT CL A

31. This MOC is relatively small with a PML of 163 (all ranks). The MOC has recently introduced the rank of MCPL into its rank progression. The number of positions at the SGT and MCPL ranks is equal, i.e. the rank inversion ratio (SGT:MCPL) is 1. In the DENT CL A model, half the current CPLs are promoted to MCPL in the first year. The occupation is also beginning to overcome an existing surplus of SGTs [4] and no promotions to SGT are forecast this year.

32. Figure 9 presents modelling results over a 25 year time horizon for promotions to SGT in MOC 722 – based on 10 simulation runs. The number of MCPLs "eligible for promotion" to SGT ranges from 17 to 30, averaging 24 over the 25 model years. The number of MCPLs promoted to SGT is forecast to vary between 2 and 6, with an average of approximately 4 per year. In terms of promotion rates, the range was 5% to 27% with an average promotion rate of 16%. These results are indicative of a sustainable SGT PML.

33. Figure 10 presents modelling results over a 25 year time horizon for average TIR at promotion to SGT in MOC 722 – based on 10 simulation runs. The TIR at promotion to SGT ranges from 2.0 to 7.7, averaging 5.5 over the 25 model years. The average TIR becomes relatively stable after the first few years of the transition and the PML at the SGT rank is sustainable.

34. The DENT CL A occupation was the subject of a recent PORT study which concluded that:

> "Despite the short term disruptions, the proposed MOC structure is viable and has many desirable characteristics of a healthy occupation." [6]

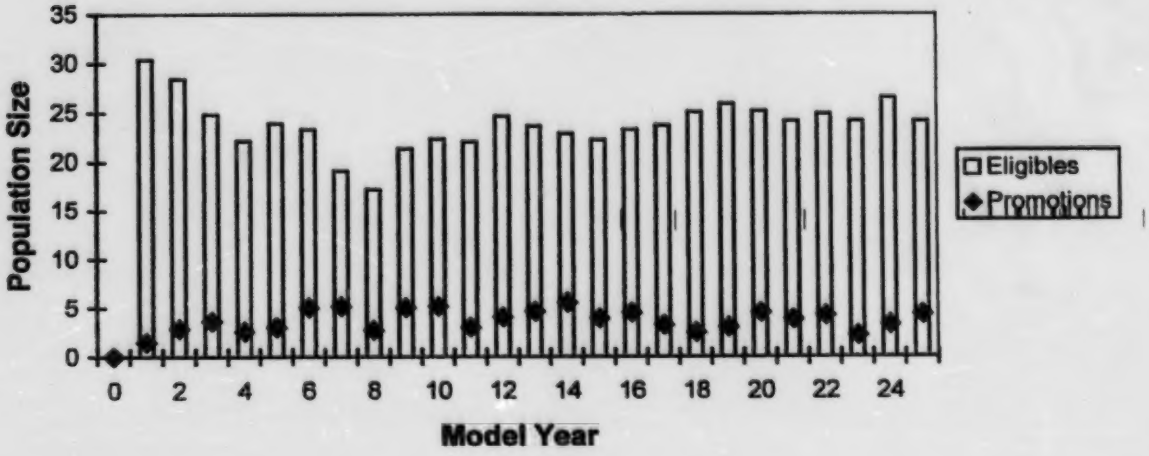

Figure 9: Forecast of Promotions to SGT DENT CL A (MOC 722)

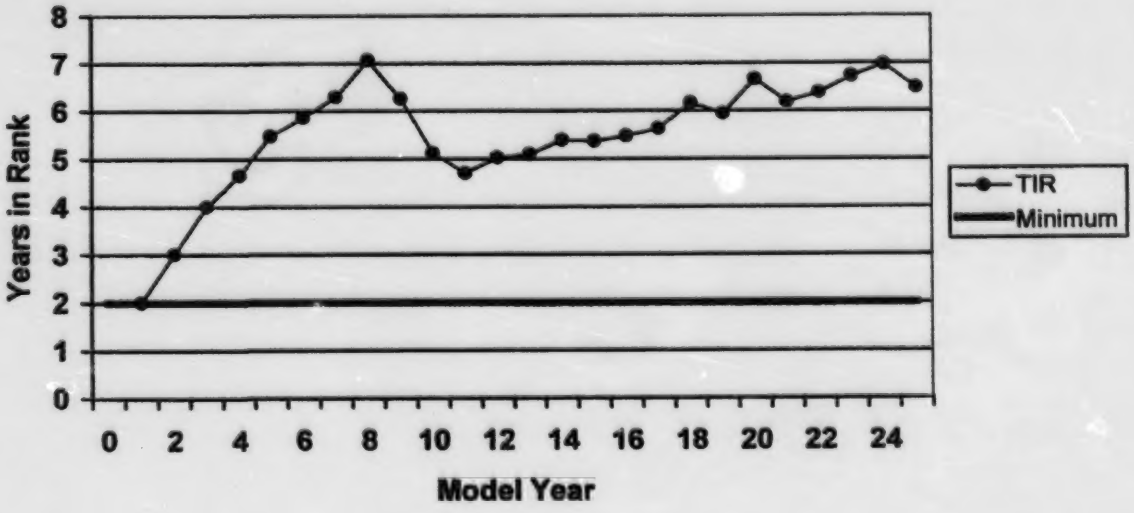

Figure 10: Forecast of Average Time in Rank at Promotion to SGT DENT CL A (MOC 722)

MOC 331 – E TECH

35. This MOC has a PML of 326 (all ranks). There is a double PML inversion at the PO2 and the MS ranks. The inversion ratio (PO2:MS) is approximately 1.1 and for (MS:LS) it is approximately 1.2. While releases in this occupation are expected to average 13 per year for the next 5 years, this should increase to 18 per year by 2010.

36. The number of MS "eligible for promotion" to PO2 ranges from 48 to 78, averaging 60 over the 25 model years. (not shown) The number of MS promoted to PO2 is forecast to vary between 7 and 16, with an average of approximately 12 per year. In terms of promotion rates, the range was 9% to 28% with an average promotion rate of 20%. These rates are acceptable for sustainability. However, serious problems are forecast for the promotion rate to MS. Figure 11 presents modelling results over a 25 year time horizon for promotions to MS in MOC 331 – based on 10 simulation runs. The number of MS "eligible for promotion" to PO2 ranges from 28 to 52, averaging 40 over the 25 model years. The number of MS promoted to PO2 is forecast to vary between 9 and 25, with an average of approximately 18 per year. In terms of promotion rates, the range was 20% to 73% with an average promotion rate of 47%. However, the trend is towards high promotion rates over 50% by 2015. Such promotion rates may be too high to sustain the MOC.

37. The TIR at promotion to PO2 ranges from 2.7 to 4.3, averaging 3.6. In general the TIR for promotion to PO2 is fairly consistent (not shown). Figure 12 presents modelling results over a 25 year time horizon for average TIR at promotion to MS in MOC 331 – based on 10 simulation runs. The TIR at promotion to MS ranges from 2.0 to 5.6, averaging 3.1 over the 25 model years. The Figure shows that although the TIR at promotion to MS is far from minimum in the next few years, the trend is downward (i.e. towards promotion at minimum TIR). This is not consistent with long term sustainability in the MOC.

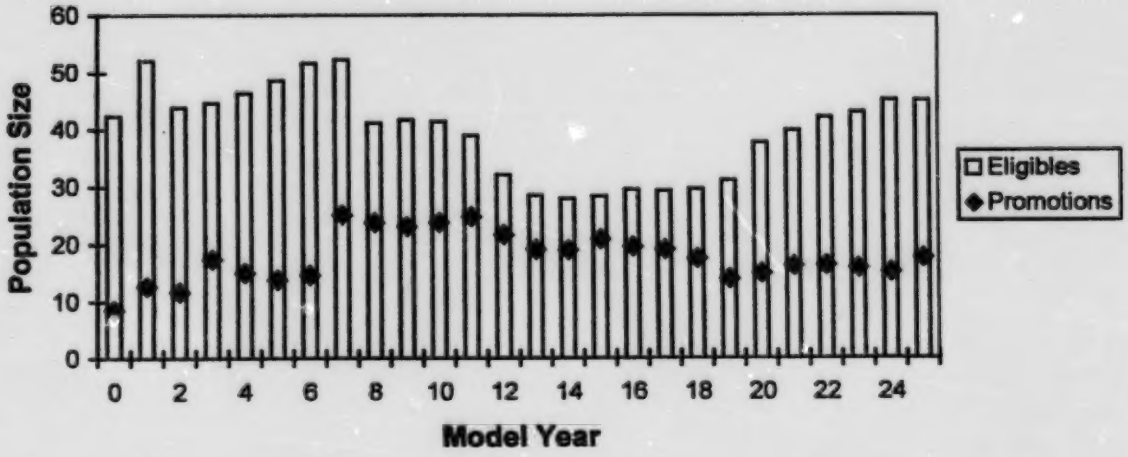

Figure 11: Forecast of Promotions to MS E TECH (MOC 331)

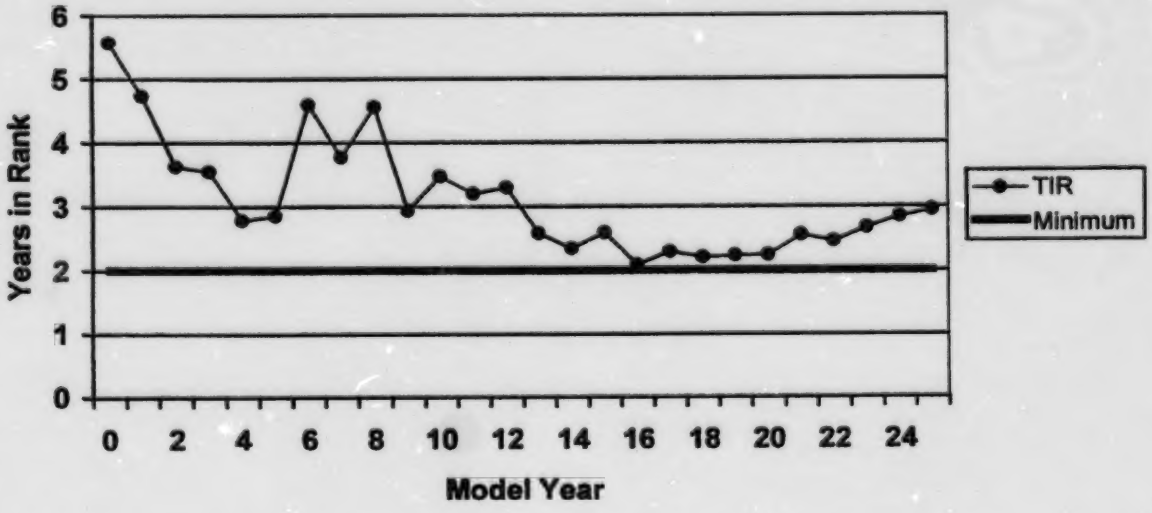

Figure 12: Forecast of Average Time in Rank at Promotion to MS E TECH (MOC 331)

MOC 642 – ED TECH

38. E TECH is a small MOC with a PML of 109 (all ranks) associated with reorganization of Construction Engineering Trades. The MOC rank progression ends at the SGT rank, with qualified personnel eligible for promotion to MOC 649 (Constriction Engineering Supervisor, CE SUPT). There is a rank inversion (SGT:MCPL) of approximately 1.1. The PSR indicates that this MOC is somewhat short at the CPL rank [4]. To overcome this PML difference, the modelling assumed an intake next year of 10 CPLs and generated a requirement for an average of 15 per year for the following four years.

39. ED TECH is one of six MOCs which "feed" into the CE SUPT MOC. As such, it is necessary to run a simulation for this entire complex in order to generate results. Figure 13 presents modelling results over a 25 year time horizon for promotions to SGT in MOC 642 – based on 10 simulation runs of the "600" series of MOCs. The number of MCPLs "eligible for promotion" to SGT ranges from 10 to 13, averaging 12 over the 25 model years. The number of MCPLs promoted to SGT is forecast to vary between 3 and , with an average of approximately 4 per year. In terms of promotion rates, the range was 21% to 43% with an average promotion rate of 31%. The CE SUPT occupation is expected to require a substantial intake of over 25 SGTs per year from its feeder occupations between 2001 and 2007. This will cause very high promotion rates to SGT during these years. Figure 13 shows that there will be qualified personnel available for promotion to SGT in the ED TECH occupation.

40. Figure 14 presents modelling results over a 25 year time horizon for average TIR at promotion to SGT in MOC 642 – based on 10 simulation runs. The TIR at promotion to SGT ranges from 3.1 to 6.9, averaging 3.8 over the 25 model years. The average TIR at promotion climbs slowly over 25 model years, indicating that the MOC is sustainable in the long run.

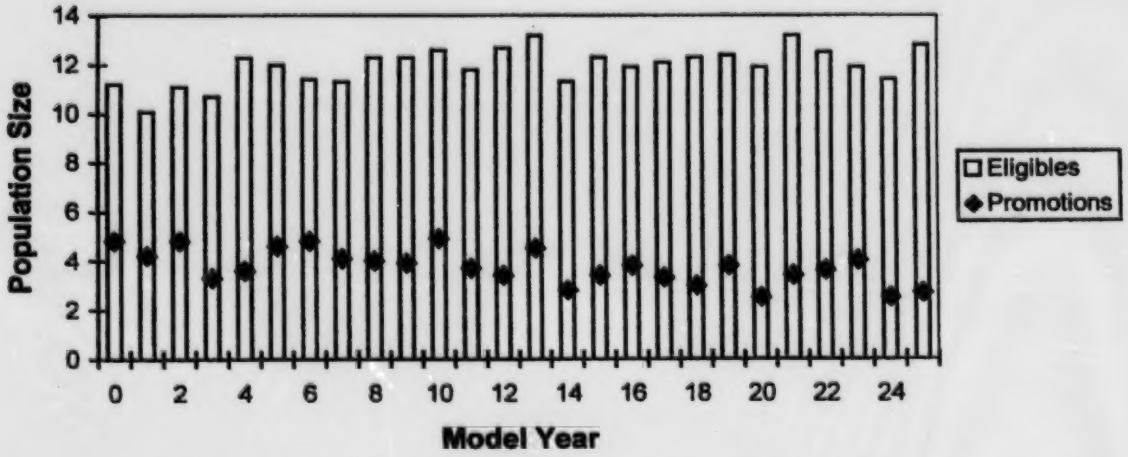

Figure 13: Forecast of Promotions to SGT ED TECH (MOC 642)

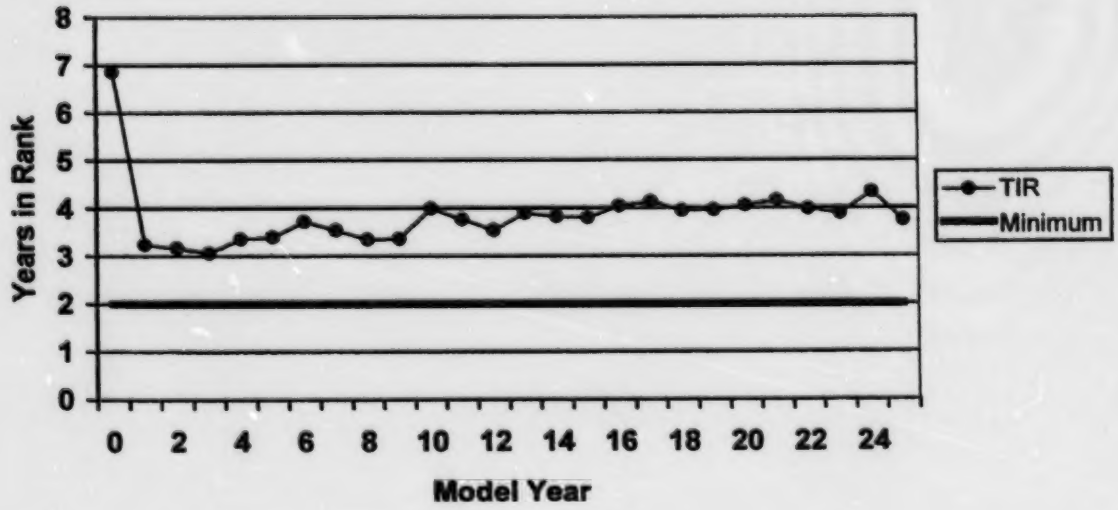

Figure 14: Forecast of Average Time in Rank at Promotion to SGT ED TECH (MOC 642)

MOC 041 – FD ENGR

41. This large MOC has a PML of 892 (all ranks). There is a PML inversion at the SGT rank. The inversion ratio (SGT:MCPL) is approximately 1.3 and the establishment for this occupation has not varied much over the past few years. As there is a flow of personnel from FD ENGR to FEE OP at the CPL rank, they must be modelled together. The FD ENGR/FEE OP model generated an intake requirement for 60 to 70 personnel per year.

42. Figure 15 presents modelling results over a 25 year time horizon for promotions to SGT in MOC 041. All results are averages of 10 simulation runs. The number of MCPLs "eligible for promotion" to SGT ranges from 72 to 104, averaging 85 over the 25 model years. The number of MCPLs promoted to SGT is forecast to vary between 10 and 25, with an average of approximately 17 per year. In terms of promotion rates, the range was 11% to 29% with an average promotion rate of 21%. Thus simulation results are indicative of a sustainable SGT PML.

43. Figure 16 presents modelling results over a 25 year time horizon for average TIR at promotion to SGT in MOC 041 – based on 10 simulation runs. The TIR at promotion to SGT ranges from 2.6 to 3.7, averaging 3.3 over the 25 model years. The model for this MOC assumes that a minimum of 2 years in rank is required before promotion to SGT is possible. If this is sufficient time to train personnel for potential promotion, there does not appear to be any difficulty in staffing the SGT rank with qualified MCPLs in spite of the population inversion. That is, manning levels are sustainable, under the assumptions made in the model.

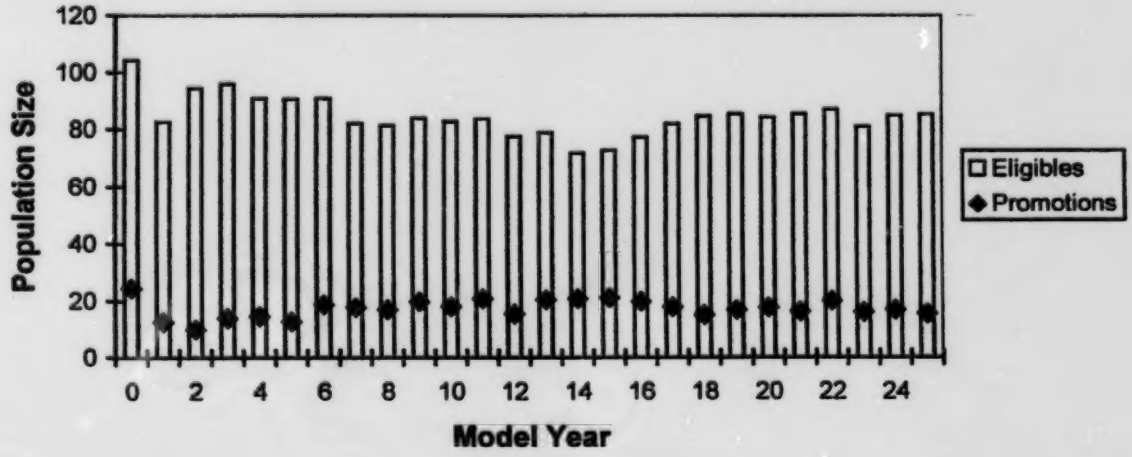

Figure 15: Forecast of Promotions to SGT FD ENGR (MOC 041)

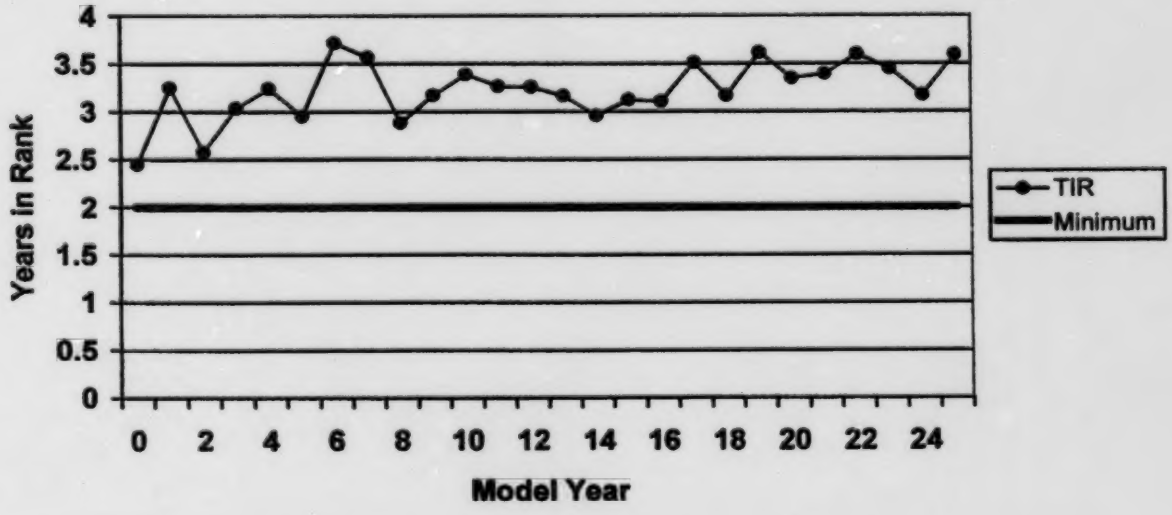

Figure 16: Forecast of Average Time in Rank at Promotion to SGT FD ENGR (MOC 041)

MOC 042 – FEE OP

44. This MOC has a PML of 245 (all ranks). There is a PML inversion at the SGT rank. The inversion ratio (SGT:MCPL) is approximately 1.4 and the establishment for this occupation has not varied much over the past few years. As there is a flow of personnel from FD ENGR to FEE OP at the CPL rank, they must be modelled together. The FD ENGR/FEE OP model generated an intake requirement for 60 to 70 personnel per year.

45. Figure 17 presents modelling results over a 25 year time horizon for promotions to SGT in MOC 042. All results are averages of 10 simulation runs of the FD ENGR/FEE OP model. The number of MCPLs "eligible for promotion" to SGT ranges from 24 to 37, averaging 28 over the 25 model years. The number of MCPLs promoted to SGT is forecast to vary between 4 and 12, with an average of approximately 7 per year. In terms of promotion rates, the range was 15% to 35% with an average promotion rate of 23%. Thus simulation results are indicative of a sustainable SGT PML.

46. Figure 18 presents modelling results over a 25 year time horizon for average TIR at promotion to SGT in MOC 042 – based on 10 simulation runs of the FD ENGR/FEE OP model. The TIR at promotion to SGT ranges from 2.7 to 5.4, averaging 4.0 over the 25 model years. This result is quite consistent with sustainability at the SGT rank in this occupation.

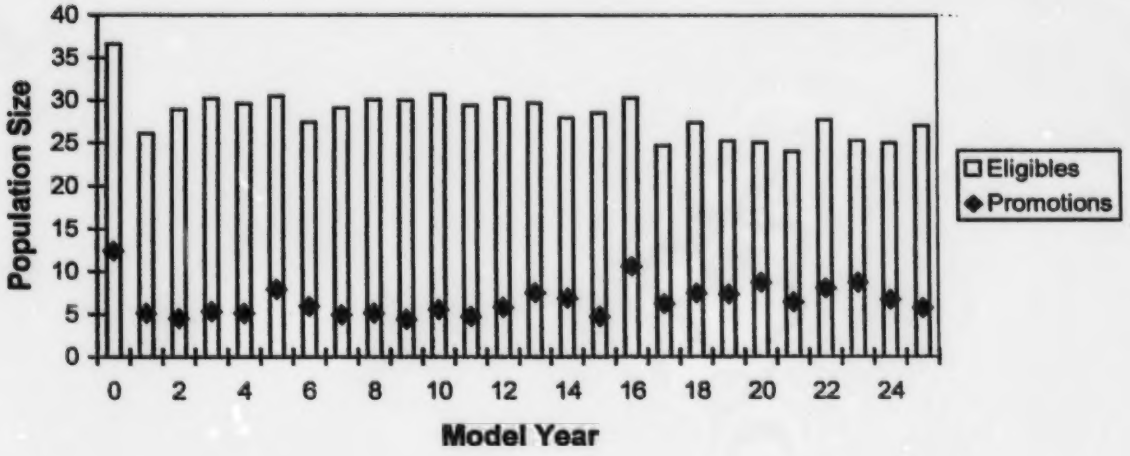

Figure 17: Forecast of Promotions to SGT FEE OP (MOC 042)

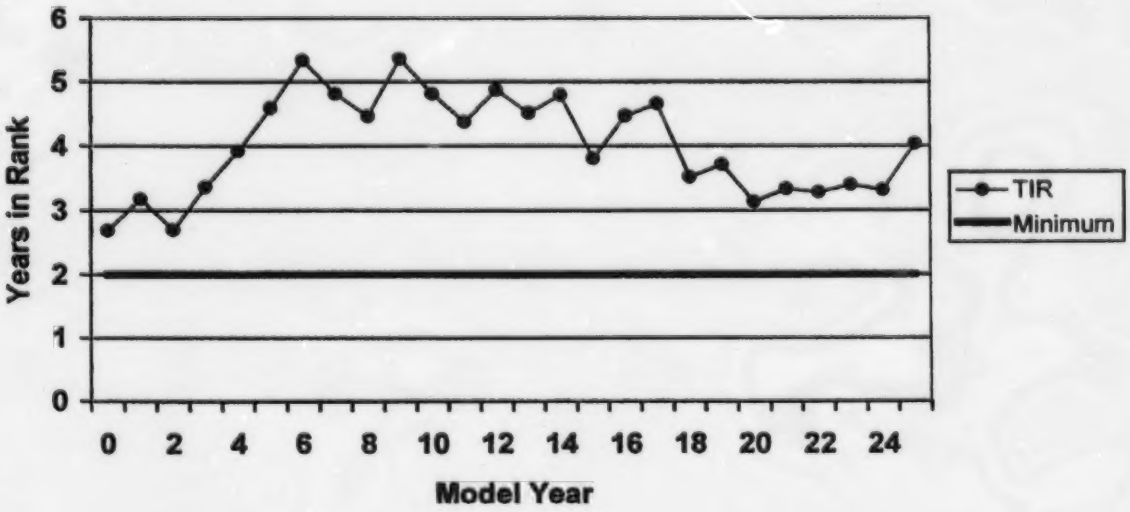

Figure 18: Forecast of Average Time in Rank at Promotion to SGT FEE OP (MOC 042)

MOC 091 – FLT ENGR

47. This MOC has a PML of 333 (all ranks). There are two PML inversions in this MOC, at the SGT and MCPL ranks. The inversion ratio (SGT:MCPL) is approximately 1.7 and for (MCPL:CPL) the inversion ratio is 2. The occupation today does not have any CPLs and is short some 30 individuals. To develop a qualified cadre to meet the demand for SGT promotions and to meet PML targets in the long-run, the model was forced into a feast/famine intake cycle (averaging 20 per year).

48. The number of MCPLs "eligible for promotion" to SGT ranges from 29 to 55, averaging 42 over the 25 model years. (not shown) The number of MCPLs promoted to SGT is forecast to vary between 7 and 22, with an average of approximately 17 per year. In terms of promotion rates, the range was 17% to 65% with an average promotion rate of 41%. The promotion rate to SGT of qualified MCPLs, while somewhat high in the short run, becomes more sustainable once PML requirements for the trade are met. There are greater problems at the MCPL rank. Figure 19 presents modelling results over a 25 year time horizon for promotions to MCPL in MOC 091. All results are averages of 10 simulation runs of the FLT ENGR model. The number of CPLs "eligible for promotion" to MCPL bounces up and down in alternate years with virtually 100% of eligible personnel promoted. In the model all qualified CPLs are promoted at the completion of minimum time in rank requirements (see Figure 20). Therefore, this MOC can be expected to have severe sustainability problems.

49. Figure 20 presents modelling results over a 25 year time horizon for average TIR at promotion to CPL in MOC 091 – based on 10 simulation runs of the FLT ENGR model. The TIR at promotion to MCPL is almost always the minimum. The TIR at promotion to SGT is more acceptable, ranging from 2.0 to 3.6 and averaging 3.0 over the 25 model years. (not shown). Thus, if flows can be regularized into the MCPL rank, the SGT rank is probably sustainable.

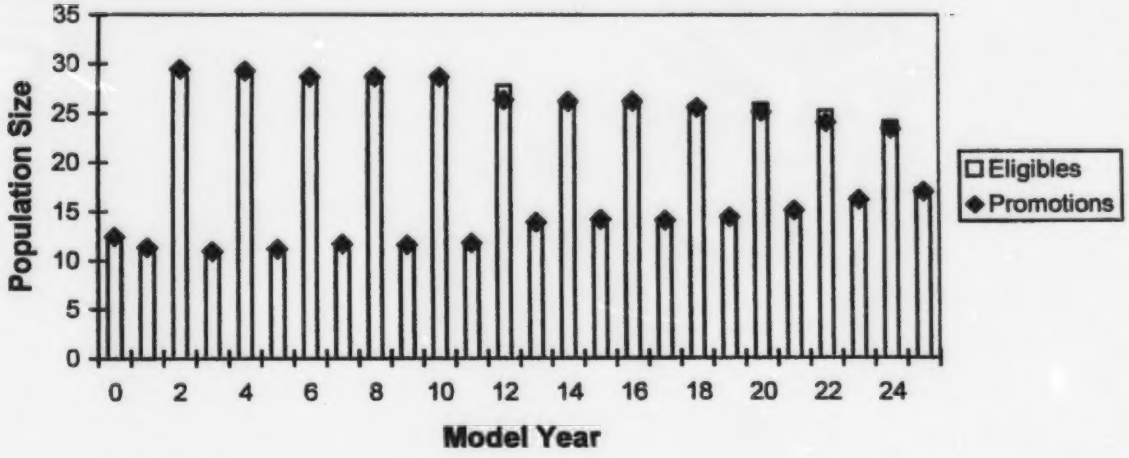

Figure 19: Forecast of Promotions to MCPL FLT ENGR (MOC 091)

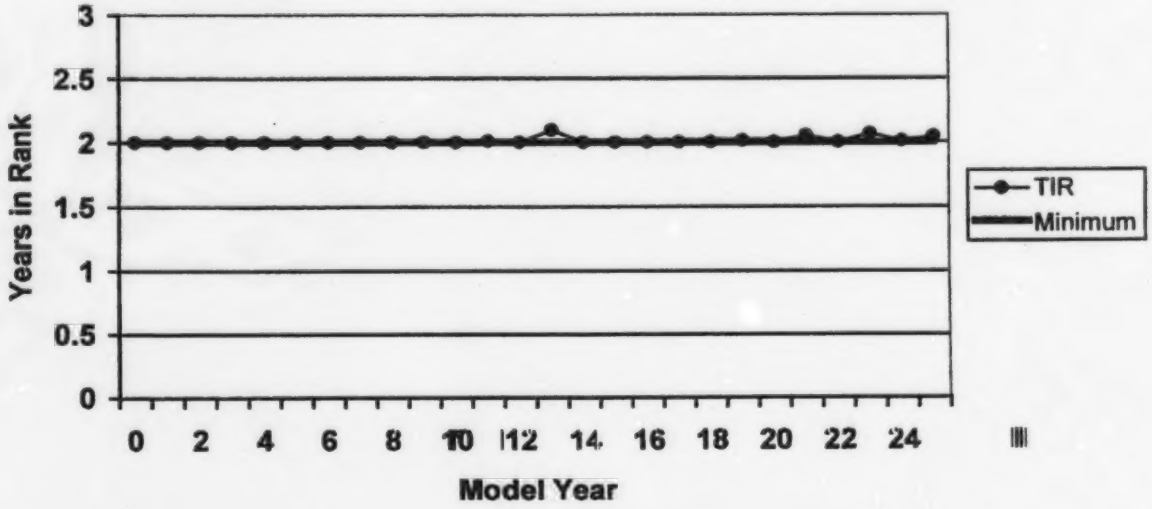

Figure 20: Forecast of Average Time in Rank at Promotion to MCPL FLT ENGR (MOC 091)

MOC 142 – GEO TECH

50. This is a relatively small MOC with a PML of 114 (all ranks). There is a rank inversion at the MCPL rank. The inversion ratio (MCPL:CPL) is approximately 5.9. However, the CPL rank is used as a placeholder for personnel transferring into the occupation. In practice, personnel transfer in at the CPL rank and are promoted to MCPL upon completion of qualification training - usually in one year.

51. Figure 21 presents modelling results over a 25 year time horizon for promotions to MCPL in MOC 142. All results are averages of 10 simulation runs of the GEO TECH model. The number of CPLs "eligible for promotion" to MCPL ranges from 7 to 8. The number of CPLs promoted to MCPL ranges from 5 to 8, averaging 7. In terms of promotion rates, the range was 71% to 100% with an average promotion rate of 87%. While the simulation results are not indicative of a sustainable MCPL PML, the MOC is in reality not facing a systemic problem with rank inversion because of the flow into the occupation at the CPL rank.

52. Figure 22 presents modelling results over a 25 year time horizon for average TIR at promotion to MCPL in MOC 142 – based on 10 simulation runs of the GEO TECH model. The TIR in this occupation, at promotion to MCPL does not deviate substantially from 1 year. However, TIR at the rank of CPL in the previous occupation is not captured in this chart. Thus, if the occupational transfer flow into GEO TECH at the CPL rank is sufficient, the MCPL rank and the MOC are sustainable.

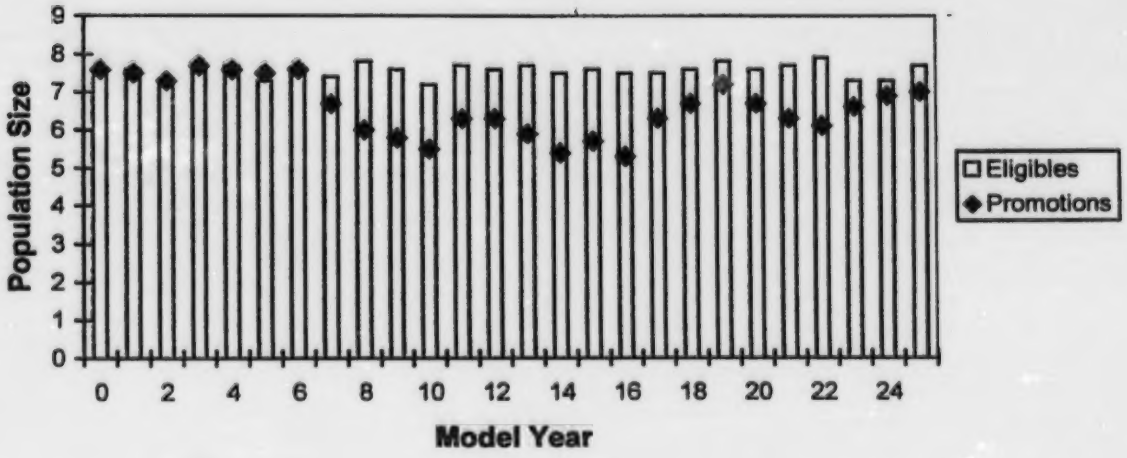

Figure 21: Forecast of Promotions to MCPL
GEO TECH (MOC 142)

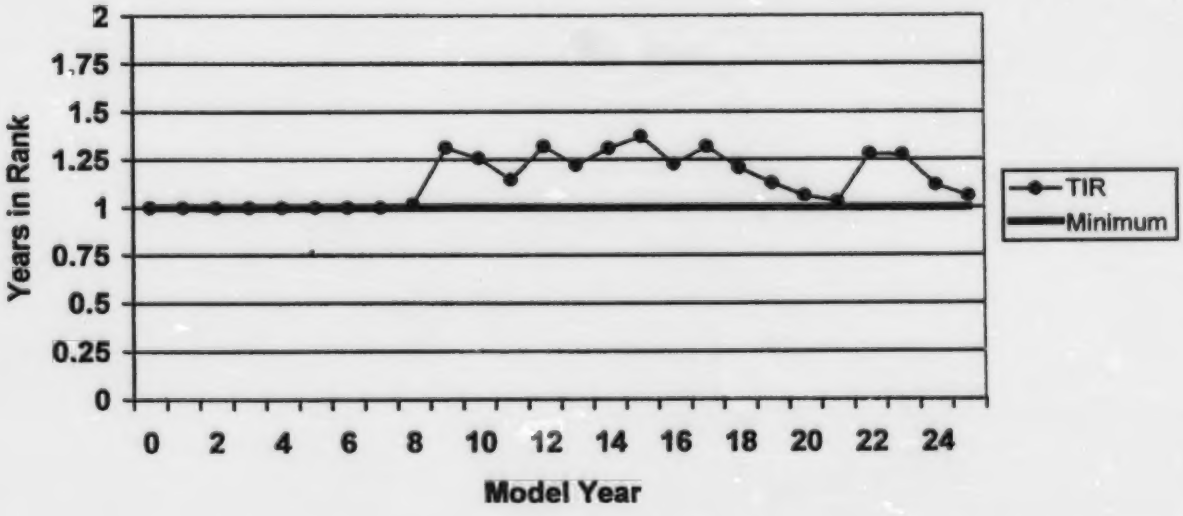

Figure 22: Forecast of Average Time in Rank at Promotion to MCPL
GEO TECH (MOC 142)

MOC 111 – INT OP

53. This MOC has a PML of 256 (all ranks). There are rank inversions at the SGT and MCPL ranks. The inversion ratio at (SGT:MCPL) and (MCPL:CPL) are approximately 1.7 and 1.6 respectively. The occupation today does not have any CPLs and is short some 30 individuals. Intake into this occupation is capped at 15 per year.

54. Figure 23 presents modelling results over a 25 year time horizon for promotions to MCPL in MOC 111. All results are averages of 10 simulation runs of the INT OP model. The number of CPLs "eligible for promotion" to MCPL ranges from 0 to 23, averaging 16. The number of CPLs promoted to MCPL ranges from 0 to 19, averaging 16. In terms of promotion rates, the range was 57% to 100% with an average promotion rate of 87%.

55. Figure 24 presents modelling results over a 25 year time horizon for average TIR at promotion to MCPL in MOC 111 – based on 10 simulation runs of the INT OP model. The TIR (in this occupation, prior to transfer in) at promotion to MCPL does not rise substantially above 1 year.

56. The simulation results are not indicative of a sustainable MCPL PML, primarily because the MOC is unable to develop enough CPLs to satisfy vacancies. After 1 year, the model had to promote any remaining CPLs to MCPL to assure that enough could be made available for promotion to SGT within the specified TIR requirement. However, the MOC is in reality not facing a systemic problem because of the flow into the occupation at the CPL rank. The CPL rank is used as a placeholder for personnel transferring into the occupation. In practice, personnel transfer in at the CPL rank and are promoted to MCPL upon completion of qualification training - usually in one year. It is important for the overall sustainment of the MOC that current staff shortages are overcome with at least a temporary loosening of the maximum intake restriction.

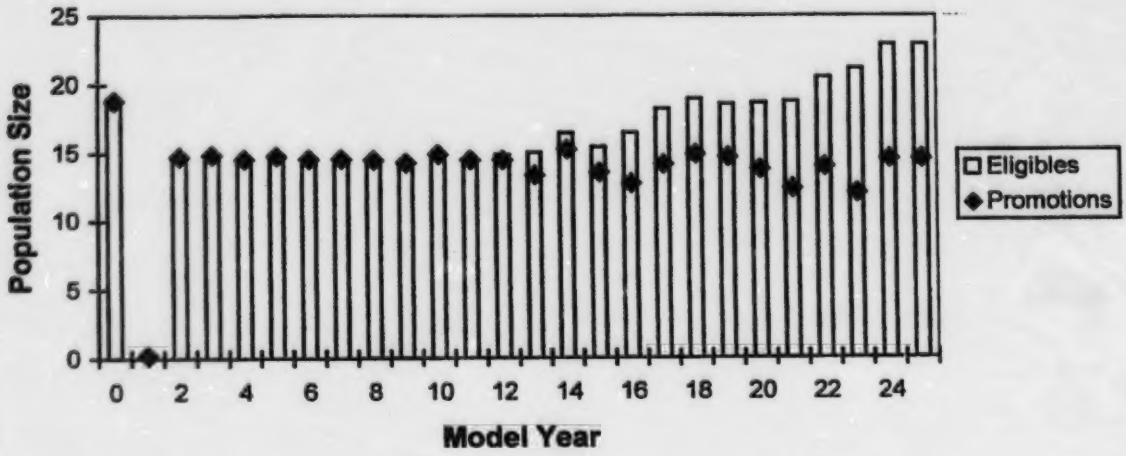

Figure 23: Forecast of Promotions to MCPL INT OP (MOC 111)

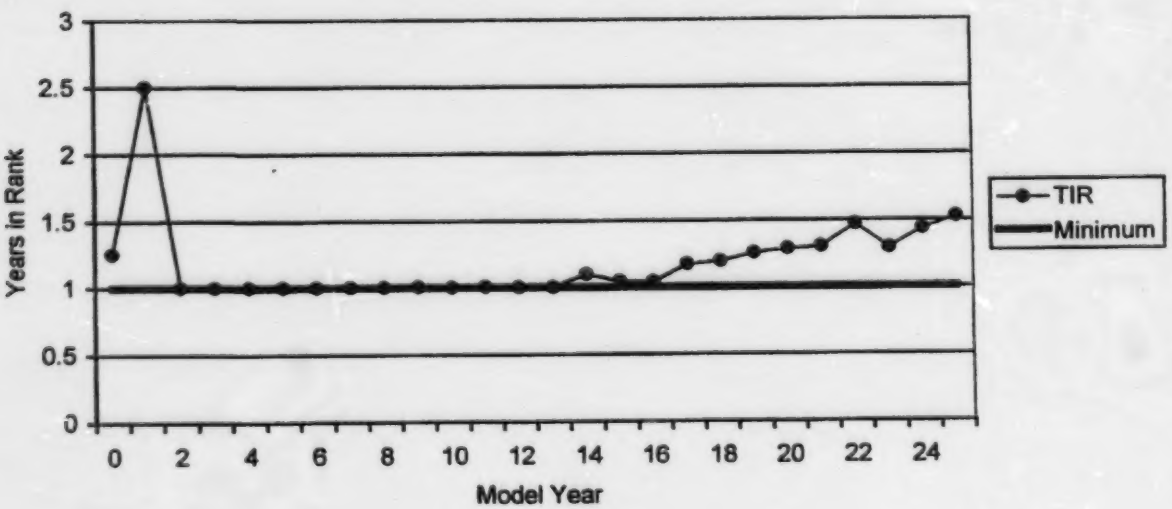

Figure 24: Forecast of Average Time in Rank at Promotion to MCPL INT OP (MOC 111)

MOC 111 – INT OP (continued)

57. Figure 25 presents modelling results over a 25 year time horizon for promotions to SGT in MOC 111. All results are averages of 10 simulation runs of the INT OP model. The number of MCPLs "eligible for promotion" to SGT ranges from 20 to 41, averaging 33. The number of MCPLs promoted to SGT ranges from 10 to 17, averaging 13. In terms of promotion rates, the range was 27% to 74% with an average promotion rate of 40%. These rates are quite high but are not inconsistent with MOC sustainability.

58. Figure 26 presents modelling results over a 25 year time horizon for average TIR at promotion to SGT in MOC 111 – based on 10 simulation runs of the INT OP model. The TIR at promotion to SGT ranges from 2.0 to 3.9 years, averaging 3.1. The average TIR is forecast to rise slowly and this improves the prospects for sustainability in this MOC.

59. When taken together, simulation results for the MCPL and SGT ranks are not indicative of a sustainable INT OP MOC. However, there is a flow of personnel into the MOC at the CPL rank who are promoted to MCPL upon completion of qualification training. Thus, the MOC is in reality not facing a permanent problem because of this intake flow.

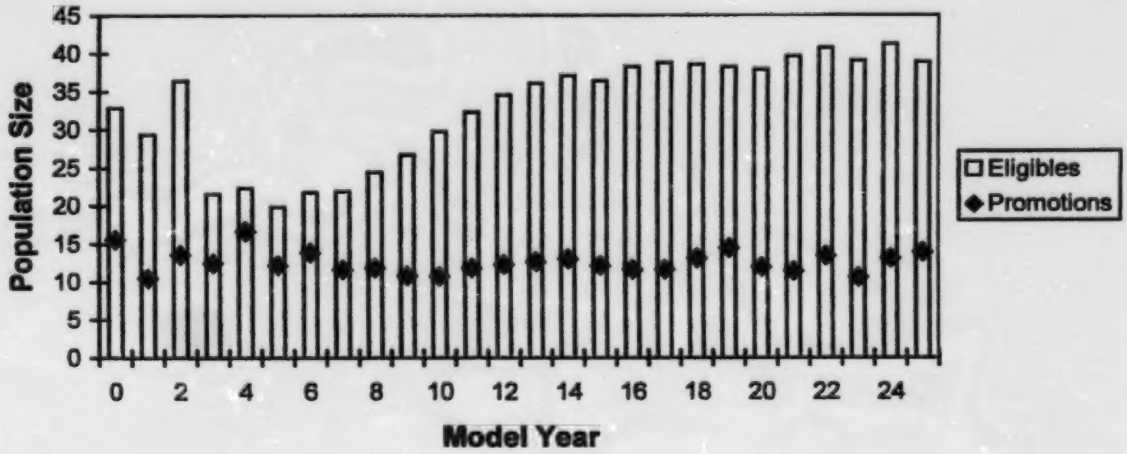

Figure 25: Forecast of Promotions to SGT INT OP (MOC 111)

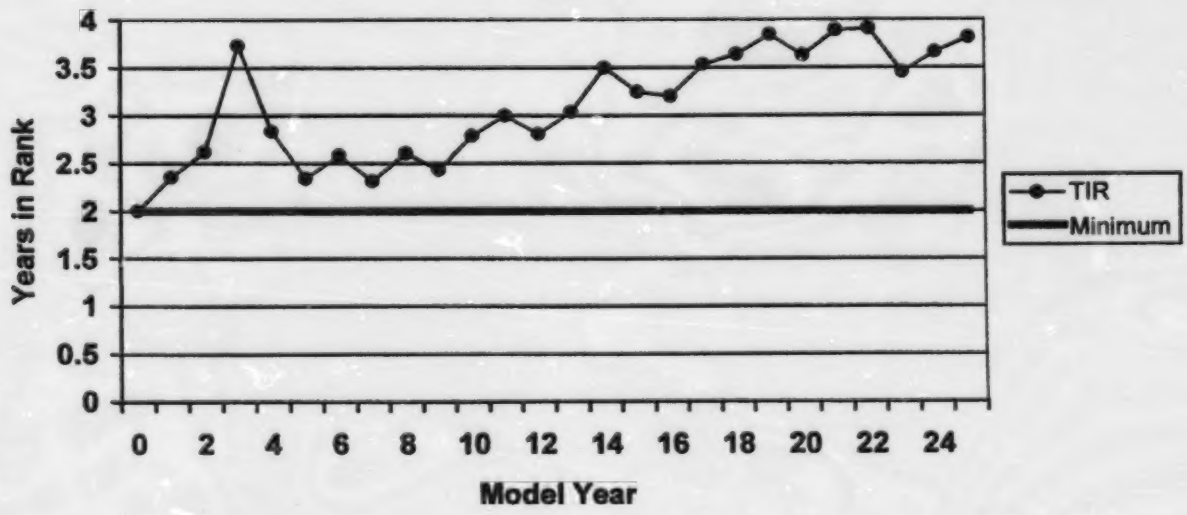

Figure 26: Forecast of Average Time in Rank at Promotion to SGT INT OP (MOC 111)

MOC 314 – MAR ENG (A) and MOC 313 – MAR ENG (T)

60. MAR ENG (A) has a PML of 303 (all ranks). There is a rank inversion at the PO1 rank. The inversion ratio at (PO1:PO2) is approximately 1.4. This MOC is modelled together with MOC 313 - MAR ENG (T) which is a "feeder" occupation for MAR ENG (A). MAR ENG (T) has a PML of 466 (all ranks). Personnel "flow" across from MOC 313 into MOC 314 at the PO2 rank. The model assumes a one year minimum to attain such qualification. As both MOCs have a PO2 rank, there is considered to be an inversion because the PO2 PML in MAR ENG (A) is approximately 1.1 times the PML for PO2 in MAR ENG (T). At present, the PO2 rank in MAR ENG (A) is overborne, although promotions to PO1 are expected to return to normal levels by 2002. There are sufficient numbers of qualified PO2s to meet this rising demand.

61. Figure 27 presents modelling results over a 25 year time horizon for promotions to PO1 in MOC 314. All results are averages of 10 simulation runs of the MAR ENG (A)/MAR ENG (T) model. The number of PO2s "eligible for promotion" to PO1 ranges from 50 to 123, averaging 60. The number of PO2s promoted to PO1 ranges from 5 to 25, averaging 20. In terms of promotion rates, the range was 4% to 48% with an average promotion rate of 36%. These rates are of concern but they are not inconsistent with MOC sustainability.

62. Figure 28 presents modelling results over a 25 year time horizon for average TIR at promotion to PO1 in MOC 314 – based on 10 simulation runs of the MAR ENG (A)/MAR ENG (T) model. The TIR at promotion to PO1 ranges from 2.2 to 7.1 years, averaging 3.4. The TIR at promotion is forecast to fall to the 3 year range once the current overborne state in this occupation is eliminated. This lower value indicates that experience levels can be expected to decline in this MOC.

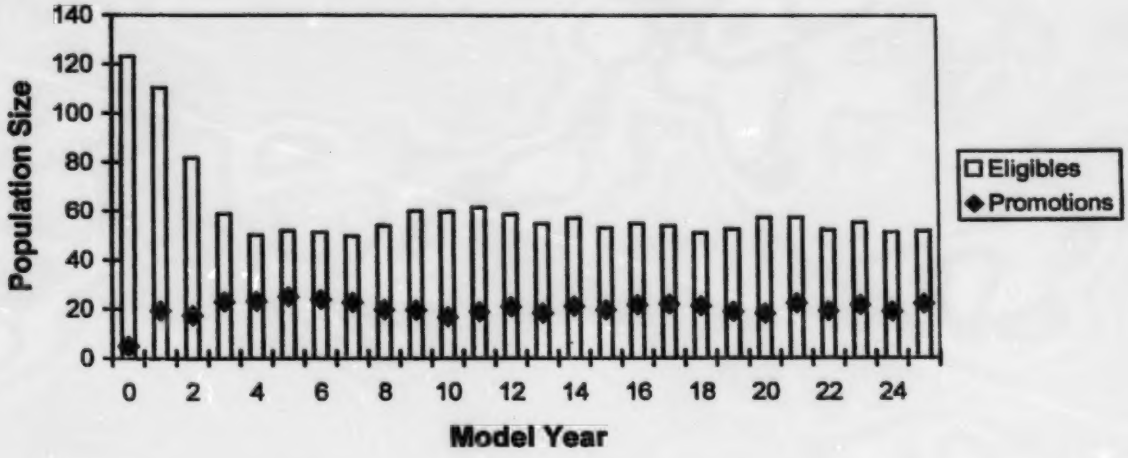

Figure 27: Forecast of Promotions to PO1
MAR ENG (A) (MOC 314)

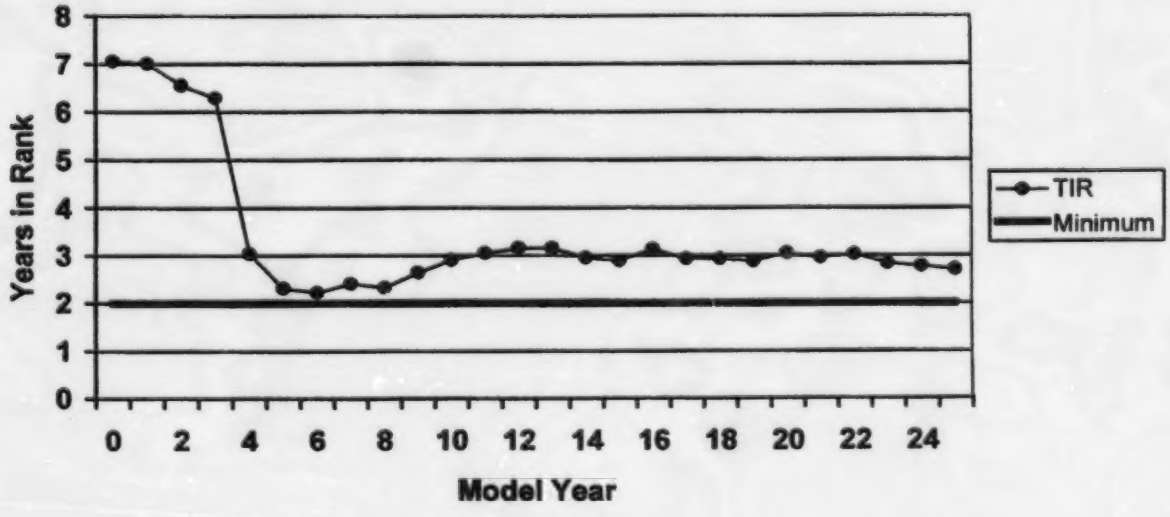

Figure 28: Forecast of Average Time in Rank at Promotion to PO1
MAR ENG (A) (MOC 314)

MOC 314 – MAR ENG (A) and MOC 313 – MAR ENG (T) (continued)

63. Figure 29 presents modelling results over a 25 year time horizon for "promotions" to PO2 in MOC 314 from PO2 in MOC 313. All results are averages of 10 simulation runs of the MAR ENG (A)/MAR ENG (T) model. The number of PO2s in MOC 313 "eligible for promotion" to PO2 in MOC 314 ranges from 41 to 80, averaging 55. The number of PO2s in MOC 313 "promoted" to PO2 in MOC 314 ranges from 0 to 34, averaging 24. In terms of promotion rates, the range was 0% to 67% with an average promotion rate of 46%. These rates are a threat to MOC sustainability in MAR ENG (A).

64. "Promotion" or occupational transfer to PO2 MAR ENG (A) from MAR ENG (T) can be met in the short run as a consequence of the overborne state of PO2 MAR ENG (A) and the short time in rank before qualification. However, there appears to be a problem in the long run. A factor affecting the "promotion" rate seen for PO2 MAR ENG (T) is the PO2 MAR ENG (A) voluntary release rate. This increases the demand for transfers by 25% from a source population in MAR ENG (T) which is 10% smaller.

65. Figure 30 presents modelling results over a 25 year time horizon for average TIR at "promotion" to PO2 in MOC 314 from PO2 in MOC 313 – based on 10 simulation runs of the MAR ENG (A)/MAR ENG (T) model. The TIR at "promotion" to PO2 in MOC 314 ranges from 1.3 to 3.3 years, averaging 1.7.

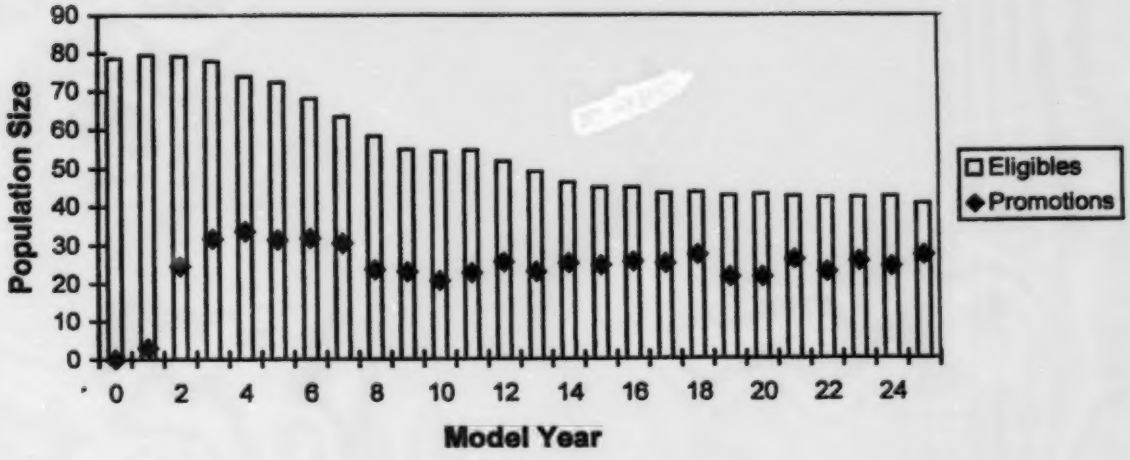

Figure 29: Forecast of "Promotions" to PO2 in MAR ENG (A) (MOC 314) From PO2 in MAR ENG (T) (MOC 313)

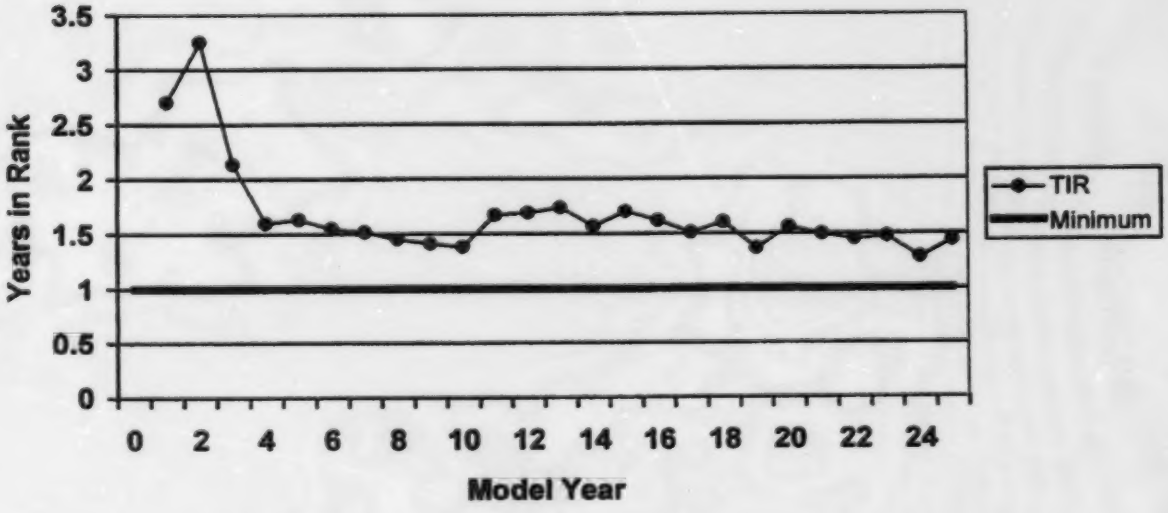

Figure 30: Forecast of Average Time in Rank at "Promotion" to PO2 in MAR ENG (A) (MOC 314) from PO2 in MAR ENG (T) (MOC 313)

MOC 121 – MET TECH

66. This MOC has a PML of 198 (all ranks). There is a rank inversion at the SGT rank. The inversion ratio at (SGT:MCPL) is approximately 3.0. This occupation has undergone reduction over the past few years with the lowest rank levels affected the most. At the moment the occupation is slightly overborne at all ranks except CPL/PTE.

67. Figure 31 presents modelling results over a 25 year time horizon for promotions to SGT in MOC 121. All results are averages of 10 simulation runs of the MET TECH model. The number of MCPLs "eligible for promotion" to SGT ranges from 7 to 19, averaging 10. The number of MCPLs promoted to SGT ranges from 0 to 9, averaging 7. In terms of promotion rates, the range was 0% to 100% with an average promotion rate of 71%. These rates are problematic for MOC sustainability. Model results indicate that promotions to SGT return to "normal rates" of seven to eight a year starting in 2005.

68. Figure 32 presents modelling results over a 25 year time horizon for average TIR at promotion to SGT in MOC 121 – based on 10 simulation runs of the MET TECH model. The TIR at promotion to SGT ranges from 2.0 to 4.7 years, averaging 2.6. However, after model year 5 promotions can barely be sustained at the year minimum time in rank requirement for the number MCPL positions available. Therefore, the MOC faces severe problems with experience levels in the long run.

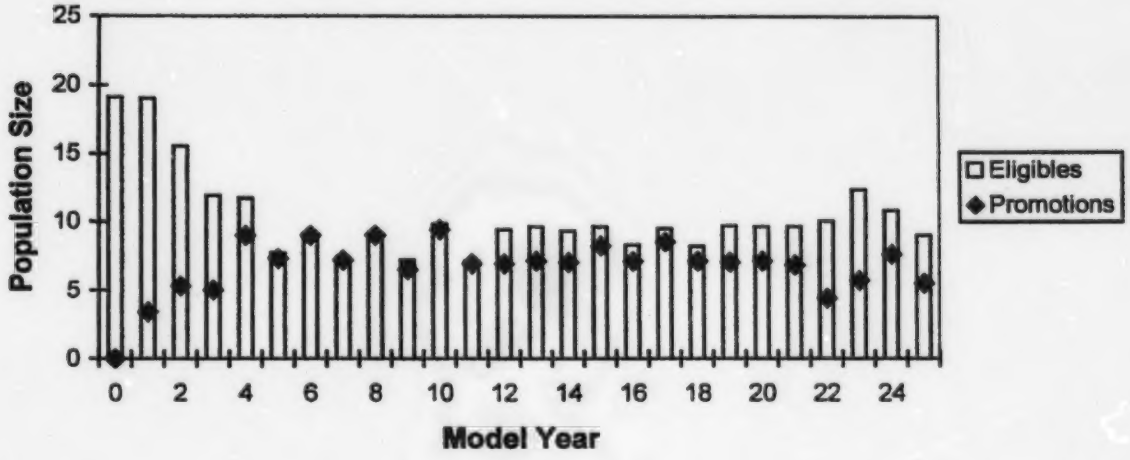

Figure 31: Forecast of Promotions SGT MET TECH (MOC 121)

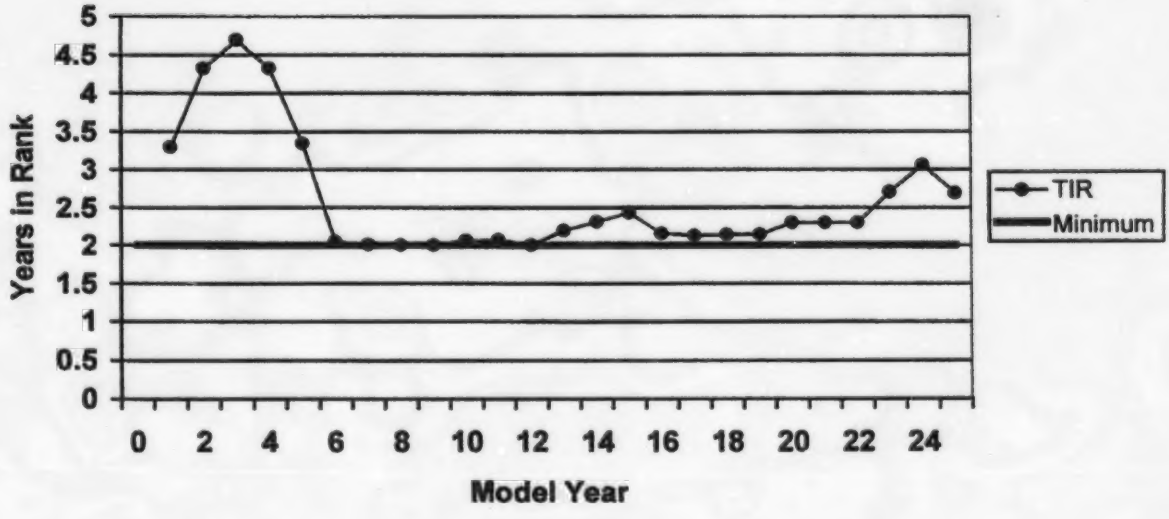

Figure 32: Forecast of Average Time in Rank at Promotion to SGT MET TECH (MOC 121)

MOC 276 – NES OP

69. This MOC has a PML of 349 (all ranks). There is a PML inversion at the PO2 rank. The inversion ratio (PO2:MS) is approximately 1.1. This occupation has undergone staff reductions in the past and is expected to undergo further reduction in next few years.

70. Figure 33 presents modelling results over a 25 year time horizon for promotions to PO2 in MOC 276. All results are averages of 10 simulation runs of the NES OP model. The number of MS "eligible for promotion" to PO2 ranges from 36 to 57, averaging 43 over the 25 model years. The number of MS promoted to PO2 is forecast to vary between 0 and 12, with an average of approximately 8 per year. In terms of promotion rates, the range was 0% to 26% with an average promotion rate of 20%. At present, promotion rates out of MS are below normal, as the occupation addresses its reduced requirements at each rank. By 2003, promotions are expected to rise to levels needed to sustain the MOS review establishment. As this is an operational MOC, intake into the MOC has been and is expected to be near the levels needed to sustain its PML. As a result, sufficient numbers of qualified MS are expected to be available for the required promotions. The NES OP rank structure has lived with inversion at MS for several years and has adapted its training and advancement policies accordingly. Thus simulation results are consistent with MOC sustainability.

71. Figure 34 presents modelling results over a 25 year time horizon for average TIR at promotion to PO2 in MOC 276 – based on 10 simulation runs of the NES OP model. The TIR at promotion to PO2 ranges from 3.0 to 4.5, averaging 3.5 over the 25 model years. This result is quite consistent with sustainability at the PO2 rank in this occupation.

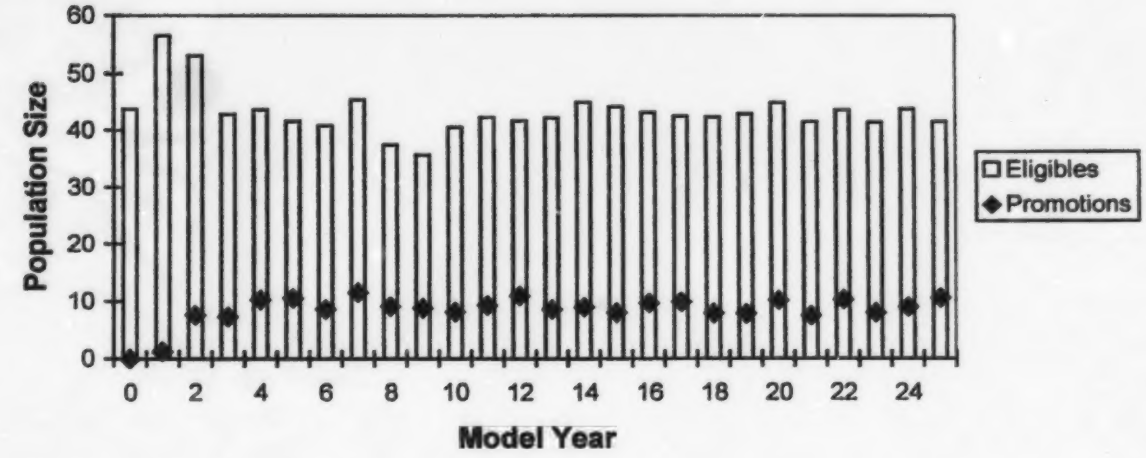

Figure 33: Forecast of Promotions PO2
NES OP (MOC 276)

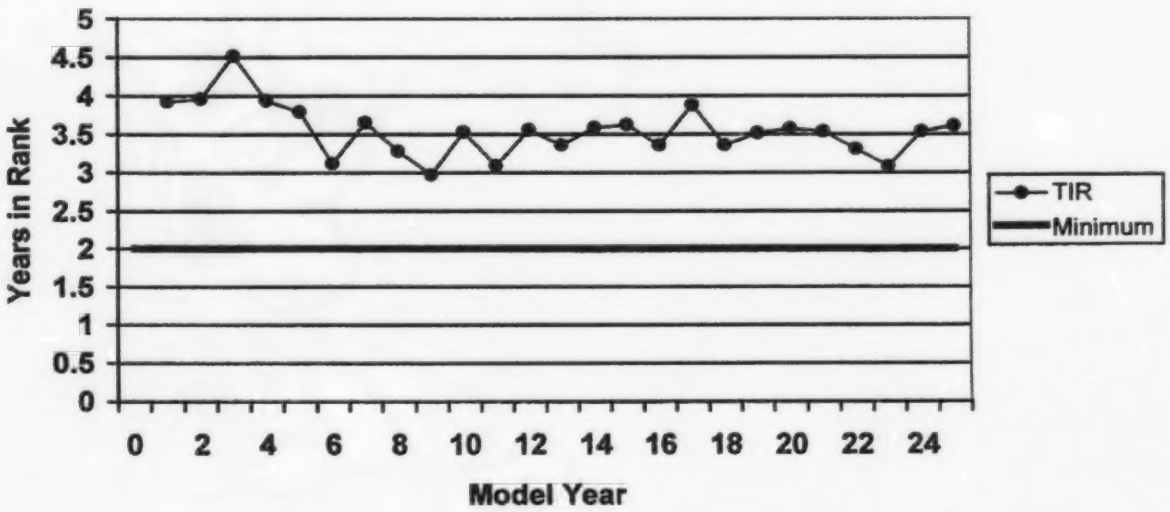

Figure 34: Forecast of Average Time in Rank at Promotion to PO2
NES OP (MOC 276)

MOC 713 – OR TECH

72. This MOC is a small specialist occupation with a PML of 33 (all ranks). There is a rank inversion at the SGT rank. The inversion ratio at (SGT:MCPL) is approximately 3.5. The occupation is a "side stream" in the "700 Series" career flow complex. It is fed from MOC 711 (Medical Assistant) at the CPL rank. As a specialist trade, there is little opportunity for advancement in the MOC. No CPLs or MCPLs are currently shown in the PSR [4] in the OR TECH occupation.

73. Figure 35 presents modelling results over a 25 year time horizon for promotions to SGT in MOC 713. All results are averages of 10 simulation runs of the medical support occupations (i.e. "700 Series") model. It is expected that until an inventory of qualified MCPLs is developed, it may be impossible to fill SGT vacancies for some period of time. The wild swings in the number of promotions to SGT in the modelling results reflect the process for developing the inventory for this trade. The number of promotions required (two per year) barely gives the trade enough time to develop the number of MCPLs needed in time to fill vacancies. Thus the MOC faces considerable risk in not being able to fill vacancies and consequently is not considered to be sustainable.

74. Figure 36 presents modelling results over a 25 year time horizon for average TIR at promotion to SGT in MOC 713 – based on 10 simulation runs of the medical support occupations (i.e. "700 Series") model. The TIR at promotion to SGT ranges from 2.0 to 3.4 years, averaging 2.5. The MOC faces problems with experience levels in the long run.

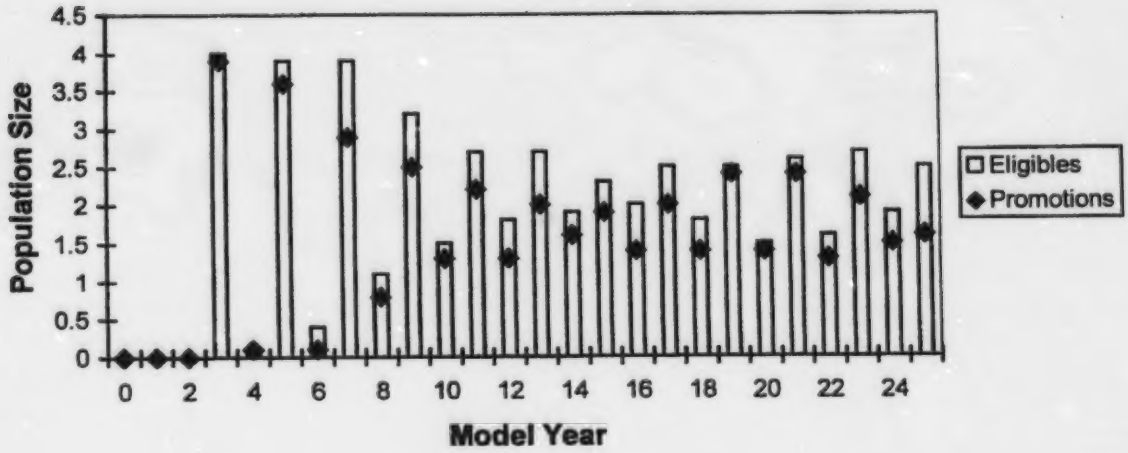

Figure 35: Forecast of Promotions SGT OR TECH (MOC 713)

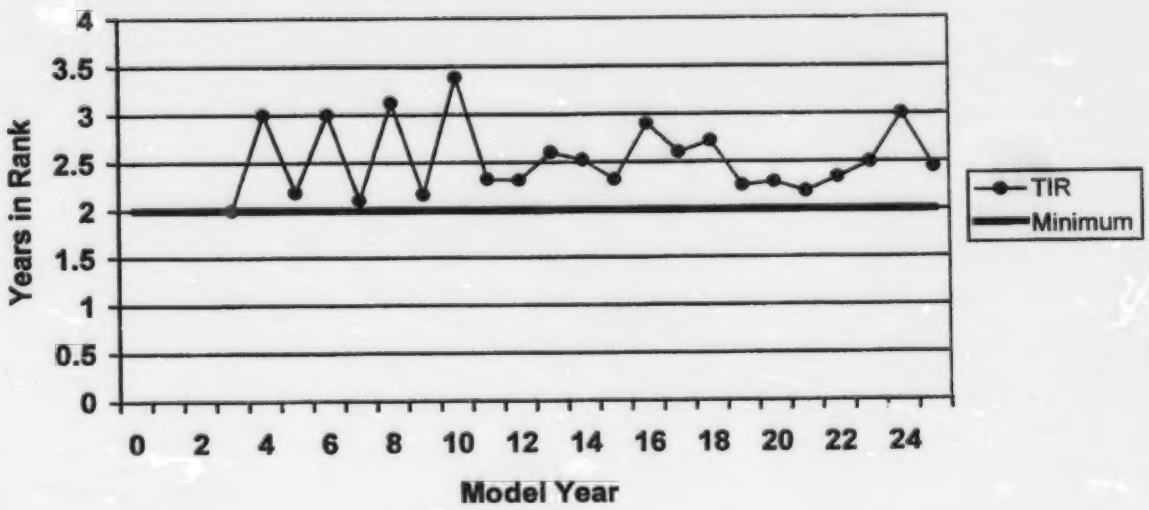

Figure 36: Forecast of Average Time in Rank at Promotion to SGT OR TECH (MOC 713)

MOC 716 – PMED TECH

75. This MOC is a small specialist occupation with a PML of 67 (all ranks). There is a rank inversion at the SGT rank. The inversion ratio at (SGT:MCPL) is approximately 1.3. The occupation is a "side stream" in the "700 Series" career flow complex. It is fed from MOC 711 (Medical Assistant) at the CPL rank. As in the case of OR TECH, there is little opportunity for advancement in the MOC.

76. Figure 37 presents modelling results over a 25 year time horizon for promotions to SGT in MOC 716. All results are averages of 10 simulation runs of the medical support occupations (i.e. "700 Series") model. The number of MCPLs "eligible for promotion" to SGT ranges from 8 to 16, averaging 12 over the 25 model years. The number of MCPLs promoted to SGT is forecast to vary between 0 and 7, with an average of approximately 4 per year. In terms of promotion rates, the range was 0% to 87% with an average promotion rate of 36%. The situation in this MOC is similar to OR TECH but less drastic. Initial promotion flow problems are forecast to be overcome as the numbers of qualified CPLs are increased. Once this occurs, the annual promotion rates of those qualified can be sustained.

77. Figure 38 presents modelling results over a 25 year time horizon for average TIR at promotion to SGT in MOC 716 – based on 10 simulation runs of the medical support occupations (i.e. "700 Series") model. The TIR at promotion to SGT ranges from 2.1 to 5.6 years, averaging 3.7. Thus the MOC appears to be sustainable in the long run.

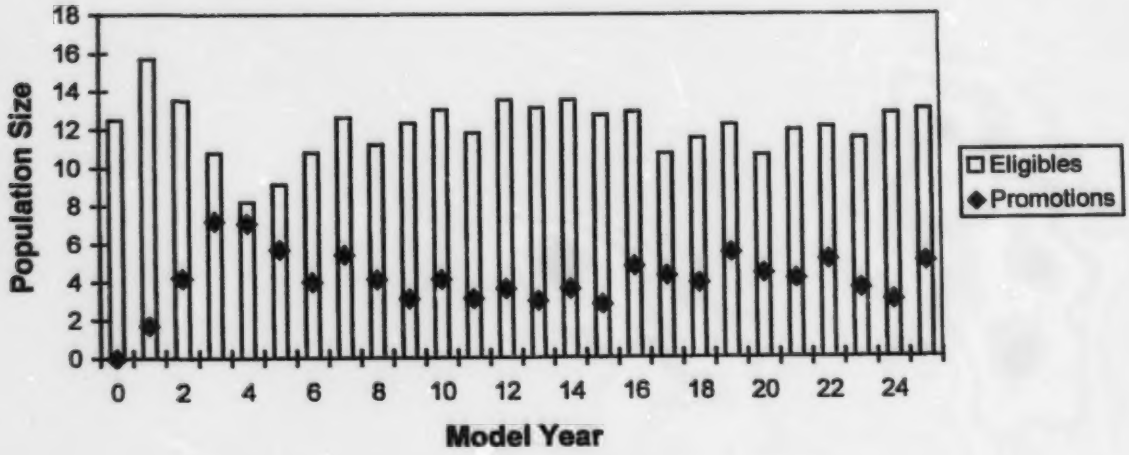

Figure 37: Forecast of Promotions SGT
PMED TECH (MOC 716)

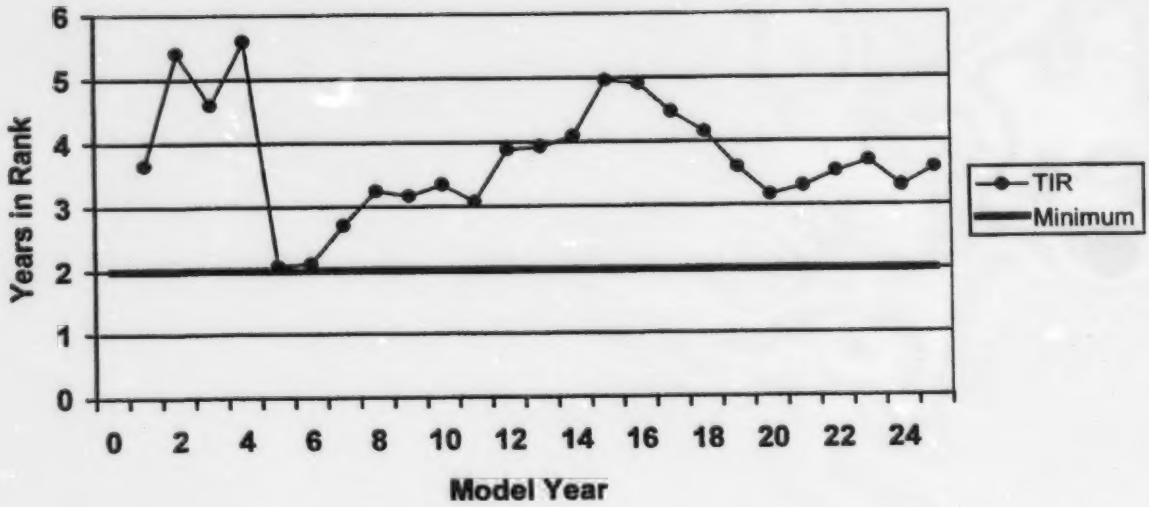

Figure 38: Forecast of Average Time in Rank at Promotion to SGT
PMED TECH (MOC 716)

MOC 836 – RMS CLK

78. This MOC is the largest examined in this analysis with a PML of 2915 (all ranks). There is a rank inversion at the SGT rank. The inversion ratio at (SGT:MCPL) is approximately 1.1. This occupation has undergone reduction in the past and is expected to undergo further reduction. The RMS CLK rank structure has lived with inversion at MCPL for several years. As the occupation has reduced, there have been few promotions to SGT. Promotions are expected to return to normal levels over the next two years.

79. Figure 39 presents modelling results over a 25 year time horizon for promotions to SGT in MOC 836. All results are averages of 10 simulation runs of the RMS CLK model. The number of MCPLs "eligible for promotion" to SGT ranges from 421 to 632, averaging 494 over the 25 model years. The number of MCPLs promoted to SGT is forecast to vary between 2 and 100, with an average of approximately 81 per year. In terms of promotion rates, the range was 0% to 23% with an average promotion rate of 17%. A sufficiently large inventory of qualified MCPLs exists to meet the demand over the modelling horizon. Therefore, the MOC has no problems with sustainability.

80. Figure 40 presents modelling results over a 25 year time horizon for average TIR at promotion to SGT in MOC 836 – based on 10 simulation runs of the RMS CLK model. The TIR at promotion to SGT ranges from 2.3 to 4.6 years, averaging 3.4.

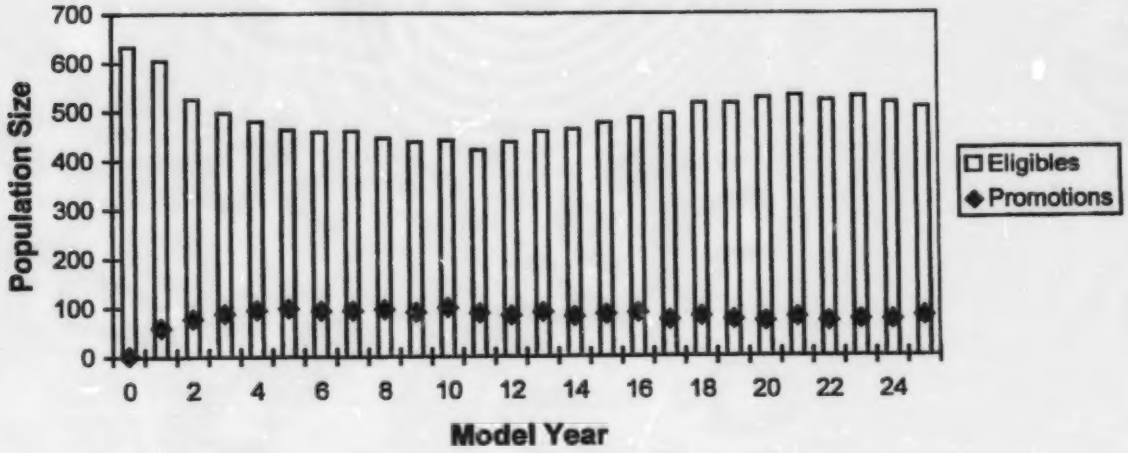

Figure 39: Forecast of Promotions SGT RMS CLK (MOC 836)

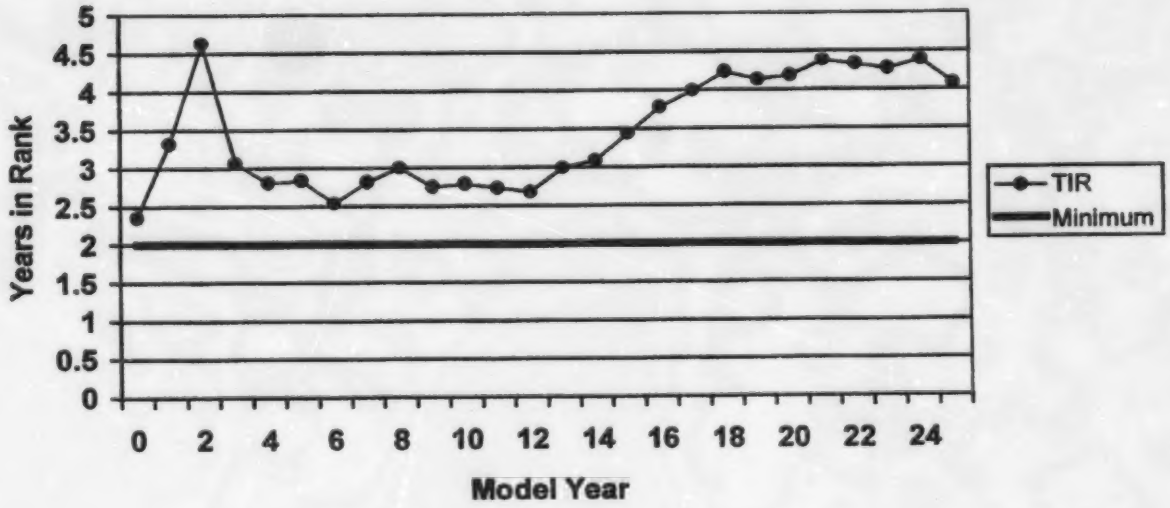

Figure 40: Forecast of Average Time in Rank at Promotion to SGT RMS CLK (MOC 836)

MOC 131 – SAR TECH

81. SAR TECH is a small MOC with a PML of 128 (all ranks). There is a rank inversion at the SGT rank. The inversion ratio at (SGT:MCPL) is approximately 1.3. The SAR TECH rank structure has lived with inversion at MCPL for several years and its PML has been steady. As this is an operational MOC, its intake has been and is expected to be near the levels needed to sustain its PML.

82. Figure 41 presents modelling results over a 25 year time horizon for promotions to SGT in MOC 131. All results are averages of 10 simulation runs of the SAR TECH model. The number of MCPLs "eligible for promotion" to SGT ranges from 36 to 44, averaging 40 over the 25 model years. The number of MCPLs promoted to SGT is forecast to vary between 2 and 10, with an average of approximately 6 per year. In terms of promotion rates, the range was 5% to 25% with an average promotion rate of 14%. Therefore sufficient numbers of qualified MCPLs are expected to be available for the required number of promotions to SGT and the MOC is sustainable.

83. Figure 41 presents modelling results over a 25 year time horizon for average TIR at promotion to SGT in MOC 131 – based on 10 simulation runs of the SAR TECH model. The TIR at promotion to SGT ranges from 2.7 to 8.3 years, averaging 6.8. This shows that personnel can be expected to have good experience levels upon promotion.

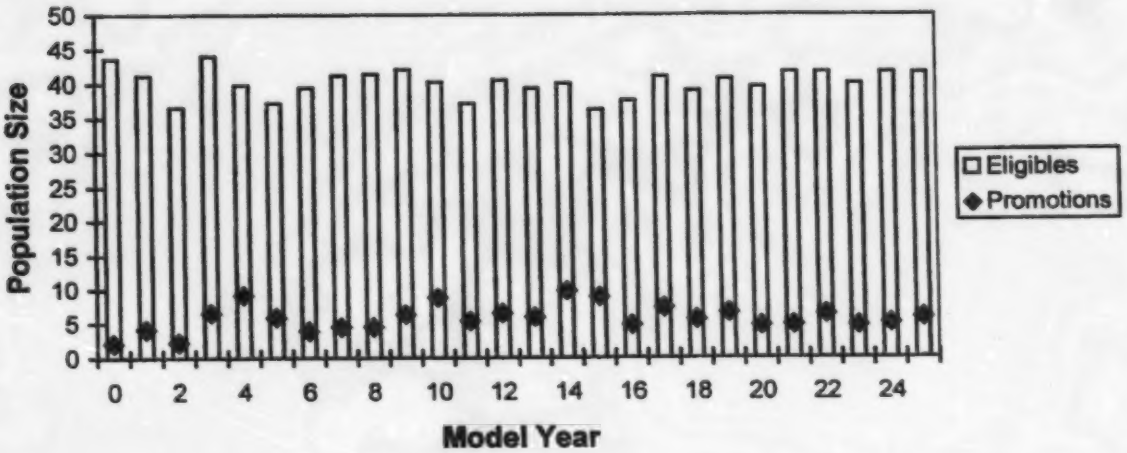

Figure 41: Forecast of Promotions SGT
SAR TECH (MOC 131)

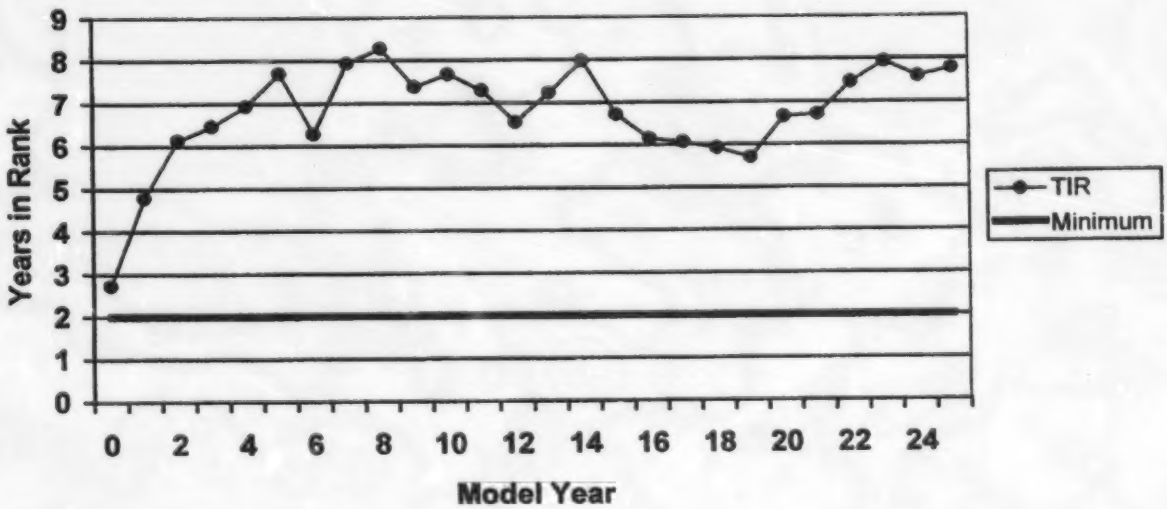

Figure 42: Forecast of Average Time in Rank at Promotion to SGT
SAR TECH (MOC 131)

V. DISCUSSION AND CONCLUSIONS

84. It has been proposed that the twenty MOCs analyzed in this study be divided into three groups according to the extent of foreseen sustainability problems associated with population inversions [5]. A suggested classification method is as follows:

a. MOCs which have little or no systemic sustainability problems in the inversion ranks and which should not require any remedial action (GREEN);
b. MOCs which have short term or intermittent sustainability problems which may require remedial action (AMBER); and
c. MOCs which have severe sustainability problems and definitely require remedial action (RED).

85. To judge analytically which MOCs have sustainability problems, criteria are required. The following criteria were approved in principle for this purpose [5]:

a. average Time in Rank close to minimum sustainable time to develop qualifications for promotion;
b. promotion rates over 50% for short periods; and/or
c. promotion rates over 30% for much longer periods.

When a MOC has one or more of the above criteria satisfied, then the MOC is judged to be RED. If the MOC has none of the above conditions satisified, then the MOC is GREEN. In cases where one or more criteria are "borderline", then the MOC is AMBER.

86. Table III lists the proposed GREEN MOCs according to the analysis reported in this paper. No remedial action is warranted for these MOCs, although they should be monitored for problems on a regular basis.

Table III

MOCs With Rank Inversions Which

Have No Sustainability Problem ("GREEN")

MOC	CODE	ABBREVIATION
Airborne Electronic Sensor Operator	081	AES OP
Artilleryman Air Defence	022	ARTYMN AD
Dental Clinic Assistant	722	DENT CL A
Field Engineer	041	FD ENGR
Field Engineer Equipment Operator	042	FEE OP
Naval Electronic Sensor Operator	276	NES OP
Resource Management Support Clerk	836	RMS CLK
Search and Rescue Technician	131	SAR TECH

87. Table IV lists the proposed AMBER MOCs according to the analysis reported in this paper. These MOCs may require further study to determine whether or not remedial action is required.

Table IV

MOCs With Rank Inversions Which

May Have Sustainability Problems ("AMBER")

MOC	CODE	ABBREVIATION
Clearance Diver Technician	342	CL DIV T
Construction Technician	648	CONST TECH
Electrical Distribution Technician	642	ED TECH
Marine Engineering (Artificer)	314	MAR ENG (A)
Preventive Medicine Technician	716	PMED TECH

88. Table V lists the proposed RED MOCs according to the analysis reported in this paper. These MOCs are forecast to have serious problems with sustainability and definitely require remedial action. The list does not include Geomatics Technician (MOC 142) and Intelligence Operator (MOC 111) which are technically in this category, but in reality use the rank below the inversion rank as a "place holder" for personnel who are pre-selected for promotion into the higher rank and are undergoing transitional training.

Table V

MOCs With Rank Inversions Which

Have Serious Sustainability Problems ("RED")

MOC	CODE	ABBREVIATION
Electrical Technician	331	E TECH
Flight Engineer	091	FLT ENGR
Marine Engineering (Technician)	313	MAR ENG (T)
Meteorological Technician	121	MET TECH
Operating Room Technician	713	OR TECH

89. Although some suggestions for remedial action have been made in the discussion of affected MOCs, a detailed examination of each situation is beyond the scope of this paper. Further work in modelling occupational sustainability is contingent upon sponsor interest and availability of resources in the PORT work program. However, this paper has demonstrated the utility of career flow simulation to gain insight into the sustainability of occupations with a variety of career development frameworks and population demographics.

90. Many features of the GeM utility have been applied to modelling the occupations in this overview paper, and yet further analysis is possible. GeM

models provide a rich set of system performance measures capturing the consequences of current and proposed HR policies (e.g. in this paper GeM models are used to forecast key performance measures of occupational sustainability). Also, since data are captured for each model year, GeM models provide immediate insight into any potential transition difficulties. Thus, occupational flow models are capable of revealing both short-term consequences of current demographics as well as long term measures of MOC sustainability. In particular, questions about how many personnel will be affected by "chokepoints" and for how long can be answered.

91. It is recommended that GeM occupational models be used in the development of proposed remedial actions for the MOCs discussed in this paper. In particular, these models could be employed to examine the feasibility of reaching and maintaining population goals with desirable demographic characteristics. Furthermore, these models could be used to investigate systemic responses to proposed HR policies, changes of attrition patterns, and varying force composition.

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[2] Director Operational Research (Corporate, Air, and Maritime) Research Note 9801, **A Strategic Military Personnel Database for Desktop Computers**, by L.F.Kerzner, Dr A. Jesion, and Dr G.H. Chan, dated February 1998 (UNCLASSIFIED).

[3] Director Operational Research (Corporate, Air, and Maritime) Research Note 9707, **Intrinsic Variability of GeM Measures of Personnel System Performance**, by L.F.Kerzner and Dr A. Jesion, dated November 1997 (UNCLASSIFIED).

[4] Directorate of Personnel Plans, Projected Status Report for FY 98/99, effective 01 Oct 97.

[5] Meeting between DSHRC and DMHRR staffs July 8, 1999.

[6] Director Operational Research (Corporate, Air, and Maritime) Research Note 9811, **Strategic Personnel Modelling for the Dental Clinic Assistant Military Occupation (MOC 722)**, by L.F.Kerzner and Dr A. Jesion, dated July 1998 (UNCLASSIFIED).

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This paper documents the Human Resource (HR) modelling support provided by the Personnel Operational Research Team (PORT) in support of the Military Occupational Structure (MOS) Review with respect to an impact assessment of whether or not rank inversion threatens the sustainability of affected occupations. Each instance of rank inversion has been examined using appropriate analytical models and available HR data. Affected Military Occupations (MOCs) have been classified in one of the following categories:

a. MOCs which have little or no systemic sustainability problems in the inversion ranks and which should not require any remedial action (GREEN);

b. MOCs which have short term or intermittent sustainability problems which may require remedial action (AMBER); or

c. MOCs which have severe sustainability problems and definitely require remedial action (RED).

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